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GALATHEA REPORT

Volume 2

Scientific Results
of The Danish Deep-Sea Expedition
Round the World 1950-52

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EXECUTIVE EDITORS:

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Leader of the Expedition

Sv. Greve, Captain, R. D. N.,
Commander of the Galathea

R. Spärck, Ph. D.,
Professor of Zoology, Vice-President of the Committee

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CORRIGENDA

TO VOLUME 2 OF GALATHEA REPORT, 1956

The final revision of depth records for the List of Stations in vol. 1 of the Galathea Report (1959, pp. 31-48) caused corrections of some of the records in vol. 2. Although they are all of minor importance, the Editors have found it appropriate to list them all here.

In the following list the first cipher refers to page, *l* = left, *r* = right column, and *f* = legend to figure, second cipher refers to line, and *a* = from above, *b* = from below.

P. 9 – *l* – 24, *b:*	10190	*Read*	10150–10190
11 – *l* – 22, *b:*	10160–10210		10150–10210
11 – *l* – 20, *b:*	9790		9820–10000
11 – *l* – 18, *b:*	7130– 7160		7160
11 – *l* – 10, *b:*	6620		6620– 6730
11 – *l* – 6, *b:*	6140– 6160		6180
11 – *l* – 4, *b:*	5850		5850– 5900
11 – *l* – 2, *b:*	7630		7640– 7680
11 – *r* – 3, *a:*	6660– 6720		6660– 6770
17 – *r* – 10, *a:*	5800		5850– 5900
18 – *r* – 4, *a:*	6660– 6720		6660– 6770
19 – *r* – 7, *b:*	6930– 7000		6900– 7000
21 – *l* – 4, *a:*	5850		5850– 5900
21 – *l* – 8, *a:*	6620		6620– 6730
21 – *l* – 6, *b:*	5850		5850– 5900
22 – *r* – 5, *b:*	5850		5850– 5900
24 – *l* – 5, *b:*	6660– 6720		6660– 6770
26 – *r* – 16, *a:*	6620		6620– 6730
26 – *r* – 13, *b:*	6930– 7000		6900– 7000
26 – *r* – 11, *b:*	6620		6620– 6730
27 – *r* – 5, *a:*	6660– 6720		6660– 6770
27 – *r* – 22, *a:*	6660– 6720		6660– 6770
29 – *r* – 16, *b:*	6140– 6160		6180
29 – *r* – 13, *b:*	5850		5850– 5900
30 – *l* – 3, *b:*	5850		5850– 5900
30 – *r* – 12, *b:*	6150		6180
34 – *l* – 14, *b:*	6930– 7000		6900– 7000
34 – *l* – 13, *b:*	7130– 7160		7160
34 – *l* – 11, *b:*	8920		8940
34 – *l* – 10, *b:*	8810– 8940		8780– 8830
34 – *l* – 6, *b:*	6620		6620– 6730
34 – *l* – 1, *b:*	4580		4510
P. 38 – *r* – 6, *b:*	7130– 7160	*Read*	7160
40 – *l* – 2, *b:*	6620		6620– 6730
40 – *r* – 1, *a:*	6140– 6160		6180
40 – *r* – 3, *a:*	6660– 6720		6660– 6770
40 – *r* – 21, *a:*	2047		2100
41 – *l* – 11, *b:*	9790		9820–10000
42 – *l* – 11, *b:*	6620		6620– 6730
42 – *l* – 7, *b:*	6140– 6160		6180
42 – *l* – 6, *b:*	6660– 6720		6660– 6770
45 – *l* – 18, *b:*	6490– 6550		6490– 6650
45 – *r* – 13, *b:*	6490– 6550		6490– 6650
47 – *r* – 2, *b:*	6660– 6720		6660– 6770
48 – *r* – 4, *a:*	8920		8940
48 – *r* – 5, *a:*	8810– 8940		8780– 8830
49 – *r* – 18, *b:*	10190		10150–10190
49 – *r* – 16, *b:*	10160–10210		10150–10210
49 – *r* – 12, *b:*	8920		8940
57 – *l* – 17, *a:*	4500		4390
57 – *l* – 22, *a:*	2580– 2610		2600
58 – *r* – 19, *b:*	4500		4390
63 – *r* – 23, *b:*	10190		10150–10190
63 – *r* – 21, *b:*	10160–10210		10150–10210
63 – *r* – 18, *b:*	6740		6730
63 – *r* – 16, *b:*	6930– 7000		6900– 7000
63 – *r* – 14, *b:*	7130– 7160		7160
64 – *l* – 5, *a:*	6620		6620– 6730
64 – *l* – 13, *a:*	6140– 6160		6180
64 – *l* – 15, *a:*	6660– 6720		6660– 6770
64 – *r* – 2, *a:*	7130– 7160		7160
64 – *r* – 5, *a:*	6620		6620– 6730
64 – *r* – 8, *a:*	6660– 6720		6660– 6770
64 – *r* – 19, *b:*	7130– 7160		7160

P. 64 – *r* – 14, *b:*	10190	*Read*	10150–10190
64 – *r* – 12, *b:*	10160–10210		10150–10210
64 – *r* – 4, *b:*	6660– 6720		6660– 6770
66 – *r* – 13, *b:*	10160–10210		10150–10210
68 – *r* – 25, *b:*	6620		6620– 6730
68 – *r* – 21, *b:*	6140– 6160		6180
69 – *l* – 8, *a:*	6140– 7000		6180– 7000
69 – *l* – 11, *b:*	6620		6620– 6730
70 – *l* – 16, *b:*	6740		6730
70 – *r* – 9, *a:*	6740		6730
71 – *l* – 19, *b:*	6740		6730
71 - *r* – 10, *a:*	6740		6730
72 - *r* – 21, *a:*	6620		6620– 6730
72 - *r* – 22, *a:*	6660– 6720		6660– 6770
72 – *r* – 1, *b:*	6620– 6720		6620– 6770
73 – *l* – 8, *b:*	6620		6620– 6730
73 – *l* – 7, *b:*	6140– 6160		6180
73 – *r* – 2, *b:*	6660– 6720		6660– 6770
74 – *l* – 14, *a:*	6930– 7000		6900– 7000
74 – *l* – 21, *b:*	6660– 6720		6660– 6770
74 – *r* – 9, *a:*	6660– 6720		6660– 6770
74 – *r* – 21, *a:*	6620		6620– 6730
82 – *l* – 20, *a:*	5090– 5110		4940– 4970
82 – *r* – 17, *a:*	5090– 5110		4940– 4970
94 – *r* – 16, *a:*	6660– 6720		6660– 6770
100 – *l* – *f*, 13:	9790		9820–10000
100 – *l* – 11, *a:*	9790		9820–10000
103 – *r* – 24, *b:*	9790		9820–10000
103 – *r* – 16, *b:*	7280		7270
104 – *l* – *f*, 20:	7280		7270
106 – *l* – 1, *b:*	7280		7270
107 – *l* – 2, *a:*	4510– 4570		4540
111 – *r* – 1, *b:*	4510– 7000		4540– 7000
112 – *r* – 7, *b:*	6660– 6720		6660– 6770
112 – *r* – 1, *b:*	6620		6620– 6730
113 – *l* – 4, *a:*	5850		5850– 5900
113 – *l* – 9, *a:*	5340		5230– 5340
116 – *l* – 9, *b:*	5340– 7000		5230– 7000
116 – *r* – 6, *a:*	6620		6620– 6730
116 – *r* – 12, *a:*	3590		3570
116 – *r* – 16, *a:*	2650– 3250		2950– 3190
118 – *r* – 7, *b:*	3590		3570
118 – *r* – 4, *b:*	2650– 3250		2950– 3190
118 – *r* – 1, *b:*	6620		6620– 6730
119 – *l* – 4, *a:*	6660– 6720		6660– 6770
119 – *l* – 10, *a:*	5850		5850– 5900
121 – *r* – 6, *b:*	6660– 6720		5850– 6770
159 – *l* – 12, *b:*	4300		4320
P. 161 – *r* – 6, *a:*	5340	*Read*	5230– 5340
161 – *r* – 7, *a:*	5850		5850– 5900
163 – *r* – 9, *a:*	4300		4320
164 – *r* – 3, *b:*	5340– 5850		5230– 5900
167 – *l* – 6, *b:*	5890		5850– 5900
167 – *l* – 4, *b:*	4390		4410
167 – *r* – 6, *a:*	4390		4410
167 – *r* – 7, *a:*	4390		4410
167 – *r* – 9, *a:*	3410		3390
167 – *r* – 10, *a:*	3590		3570
176 – *l* – 19, *a:*	3410		3390
176 – *l* – 21, *a:*	3580		3830
176 – *l* – 23, *a:*	5340		5230– 5340
176 – *l* – 25, *a:*	3670		3270– 3670
176 – *r* – 6, *a:*	4390		4410
177 – *l* – 1, *b:*	4390		4410
177 – *r* – 7, *a:*	840– 920		880– 920
178 – *l* – 7, *b:*	3410		3390
178 – *r* – 11, *a:*	3590		3570
178 – *r* – 14, *a:*	3190		2950– 3190
179 – *r* – 5, *b:*	3590		3570
180 – *l* – 12, *a:*	3410		3390
180 – *l* – 15, *a:*	3590		3570
180 – *l* – 19, *a:*	3670		3270– 3670
181 – *l* – 18, *a:*	3670		3270– 3670
191 – *r* – 15, *a:*	6730– 6770		6660– 6770
191 – *r* – 21, *a:*	4510– 4570		4540
200 – *r* – 11, *a:*	4510– 4570		4540
200 – *r* – 12, *a:*	6730– 6770		6660– 6770
210 – *l* – *f*, 21:	8210		8300
210 – *l* – 4, *a:*	8210		8210– 8300
210 – *l* – 8, *a:*	7150		6960– 7000
218 – *r* – 7, *a:*	7150– 8210		6960– 8300
219 – *l* – *f*, 35:	7150		7000
219 – *l* – 4, *a:*	7150		6960– 7000
229 – *r* – 20, *a:*	7150		6960– 7000
232 – *l* – 21, *b:*	1000– 8200		1000– 8300
237 – *r* – 9, *b:*	2690		2770
237 – *r* – 6, *b:*	3590		3570
237 – *r* – 5, *b:*	3590– 3670		3570– 3670
237 – *r* – 3, *b:*	4390– 4570		4410– 4540
243 – *l* – 7, *a:*	3300– 3400		3310
243 – *l* – 10, *a:*	595		610
243 – *l* – 13, *a:*	4510– 4570		4540
247 – *l* – 8, *a:*	3400		3310
250 – *r* – 7, *a:*	595		610
250 – *r* – 9, *a:*	3300– 3400		3310
250 – *r* – 13, *a:*	4510– 4570		4540

FOREWORD

The present volume is Number Two of a series planned to contain the scientific results of the Danish Deep-Sea Expedition Round the World 1950-52.

In the main it consists of papers on animals caught at depths exceeding 6000 meters.

Volume Number One is in print. It contains a short narrative of the cruise and a detailed list of the stations, besides some results of a general character such as bacteriology, productivity, and echo-soundings.

The publication of a special Galathea Report has been made possible by a grant from Statens Almindelige Videnskabsfond (The Danish State Research Foundation). On behalf of the Galathea Committee, the Executive Editors extend the warmest thanks to the Foundation for the grant, which has made possible the publication of the main scientific work of the Expedition.

THE EDITORS

ACTINIARIA

FROM DEPTHS EXCEEDING 6000 METERS

By OSKAR CARLGREN †
Zoological Institute, Lund, Sweden

WITH 1 PLATE

As it may be a long time before all the Actiniaria collected by the Galathea Expedition can be worked up, only the species taken at depths of about 6000 meters and deeper down will be treated. Unfortunately, the specimens are not too well preserved. They are usually strongly contracted, and the internal organs are often broken and pressed together which makes the examination difficult. Perhaps, it would have been preferable if more samples had been preserved in formalin which may give better results than samples fixed in alcohol, which was generally used.

List of Stations and the names of species of each.

Station
418. 10°13′N 126°43′E, clay with stones, 10190 m.
Galatheanthemum hadale
419. 10°19′N 126°39′E, clay, 10160-10210 m.
Galatheanthemum hadale
435. 10°20′N 126°41′E, 9790 m.
Galatheanthemum hadale
466. 10°21′S 110°12′E, clay, 7130-7160 m.
Paraedwardsia lemchei
495. 5°26′S 130°58′E, clay, 7290-7250 m.
Daontesia mielchei
649. 35°16′S 178°40′W, clay, 8210-8300 m.
Galatheanthemum profundale,
Bathydactylus kroghi
650. 32°20,5′S 176°54′W, clay with pumice, 6620 m.
Galatheanthemum profundale
651. 32°10,5′S 177°14′W, clay, 6960-7000 m.
Galatheanthemum profundale
653. 32°09′S 176°35′W. 6140-6160 m.
Galatheanthemum profundale
654. 32°10′S 175°54′W, pumice, 5850 m.
Galatheanthemum profundale
656. 35°20′S 178°55′W, 7630 m.
Galatheanthemum profundale

Station
658. 35°51′S 178°31′W, sand with clay and stones, 6660-6720 m.
Galatheanthemum profundale,
Hadalanthus knudseni,
and an unnamed species.

FAM. EDWARDSIIDAE

Paraedwardsia lemchei n. sp.

Textfig. 1.

The numerous specimens are very badly preserved. The aboral end is physa-like, but whether it is distinctly separated from the scapulus is difficult to decide, because the ectoderm of the whole column is lost. There are, however, apparently, no papillae on the aboral end, and, therefore, it is probable that a physa is present. The scapus is provided with numerous small papillae, clearly visible when the column is contracted. There are definitely no nemathybomes. The uppermost part of the column forms a scapulus. The rather long tentacles seem to be 14-16 in number; their arrangement is difficult to make out, but apparently there is no great difference in length between the inner and outer tentacles. The mesogloea of the lateral parts of the actinopharynx is very thick. The retractors of the 8 perfect mesenteries are diffuse, but of rather varying appearance. In figure 1*a* I have drawn a retractor. The mesogloea of the parietal muscles is very thick, usually thicker than that figured in fig. 1*b*.

The nematocysts of the tentacles are partly 35-50.8 × (3.5)-4.2 μ, basitrichs, partly 49.3-52.2 × 5.6-7 μ, microbasic *p*-mastigophors (possibly belonging to the actinopharynx); those of the actinopharynx partly 35-49.3 × (3.5)-4.2 μ, basitrichs, partly 43.7-49.3 × 5.6-6.3 μ, microbasic *p*-mastigophors, partly 35.2-42.3 × about 4.2 μ, partly 2.6-3.5 μ, both basi-

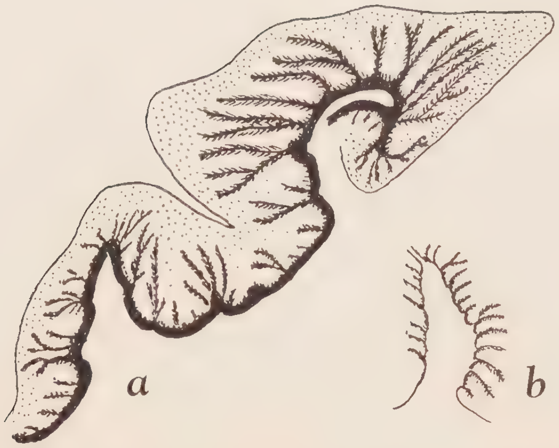

Fig. 1. *Paraedwardsia lemchei*. *a*, retractor of a mesentery. *b*, parietal muscle.

trichs (the examination is difficult owing to the poor preservation of the internal organs).

Size in very contracted state: Length up to 2 cm, outer tentacles up to 1.3 cm.

Type locality: Galathea St. 466. The type, 20 mm long, is preserved in the Zoological Museum of Copenhagen.

Occurrence: St. 466, numerous specimens.

Remarks: This species is nearly related to *Paraedwardsia abyssorum* from a depth of 5010-5600 m in the Atlantic, but there are several differences, e.g. in the appearance of the retractors and basilar muscles of the mesenteries. On the whole, the present species seems to be more robust than *abyssorum*. I have referred both species to *Paraedwardsia* though I have not seen any tenaculi, but the numerous mesogloeal papillae indicate that such may have been present.

This species is named in honour of Dr. Henning Lemche, Zoologist of the Expedition.

FAM. GALATHEANTHEMIDAE nov. fam.

Athenaria the proximal end of which shows a varying shape. Body divisible into scapus and scapulus. Scapus forming a tube into which the animal may withdraw the upper part of the body. Sphincter very strong, mesogloeal. The retractors of the mesenteries weak, diffuse.

Galatheanthemum nov. gen.

Body very elongate, divisible into scapus and scapulus, the former with a very strong cuticle, the outer part of which has been more or less detached from the inner part, forming a tubus into which the animal may withdraw the upper part of the body. Aboral end of the body round or flattened, in the former case considerably narrower than the upper part of the body. Sphincter strong, mesogloeal. Tentacles few, short in comparison with the length of the animal, their longitudinal muscles ectodermal as also the radial muscles of the oral disc. Two siphonoglyphs and two pairs of directives. Six pairs of mesenteries perfect. Mesenteries hexamerously, regularly arranged except for the last cycle which is unilaterally developed. Retractors weak, diffuse, sometimes very weak. Parietal muscles forming coarse folds on a very thickened mesogloea. The mesenteries of the two first cycles fertile. Dioecius. Cnidom: Spirocysts, basitrichs, microbasic *p*-mastigophors.

Galatheanthemum profundale n. sp.

Textfigs. 2–3. Pl. 1, fig. 2-9.

The body is very long, rather broad in the uppermost part, in the aboral end narrower, sometimes very narrow. The scapus is provided with a cuticle. In the smallest individuals, in size from a few millimeters, the cuticle is not present, certainly usually lost; in the others it is very strong and forms, especially in larger individuals, two layers, the inner sometimes lighter than the outer black-brown one. In larger individuals the outer cuticle is, at least in the greater part of the body, free from the inner cuticle, forming a tube into which the animal can retract its upper part. Sometimes the detachment of the cuticle has occurred periodically so that there are two to four tubes as stuck one into another. The animal is, however, still attached to the primary substratum. The schematic figure 2*a* shows an animal with four tubes (the soft part is dotted), and the figures 4-6, Pl. 1, specimens with different numbers of tubes. In a "colony" two specimens, the one considerably smaller than the other, are surrounded by a common second tube formed by the larger animal (pl. 1, fig. 4). The smaller specimen undoubtedly have attached itself to the larger one after that its tubes had been developed. Fig. 3 shows a specimen on which a *Scalpellum* is attached in a similar way. The aboral end shows a varying appearance. It is rounded and thin if there is a hole, as in pumice, in which the animal can fasten itself (Pl. 1, fig. 2), otherwise it extends and assumes a more or less irregular appearance or forms a round disc on the underside of which a polished cake of clay a little wider than the disc is attached (pl. 1, figs. 7, 9). The body is

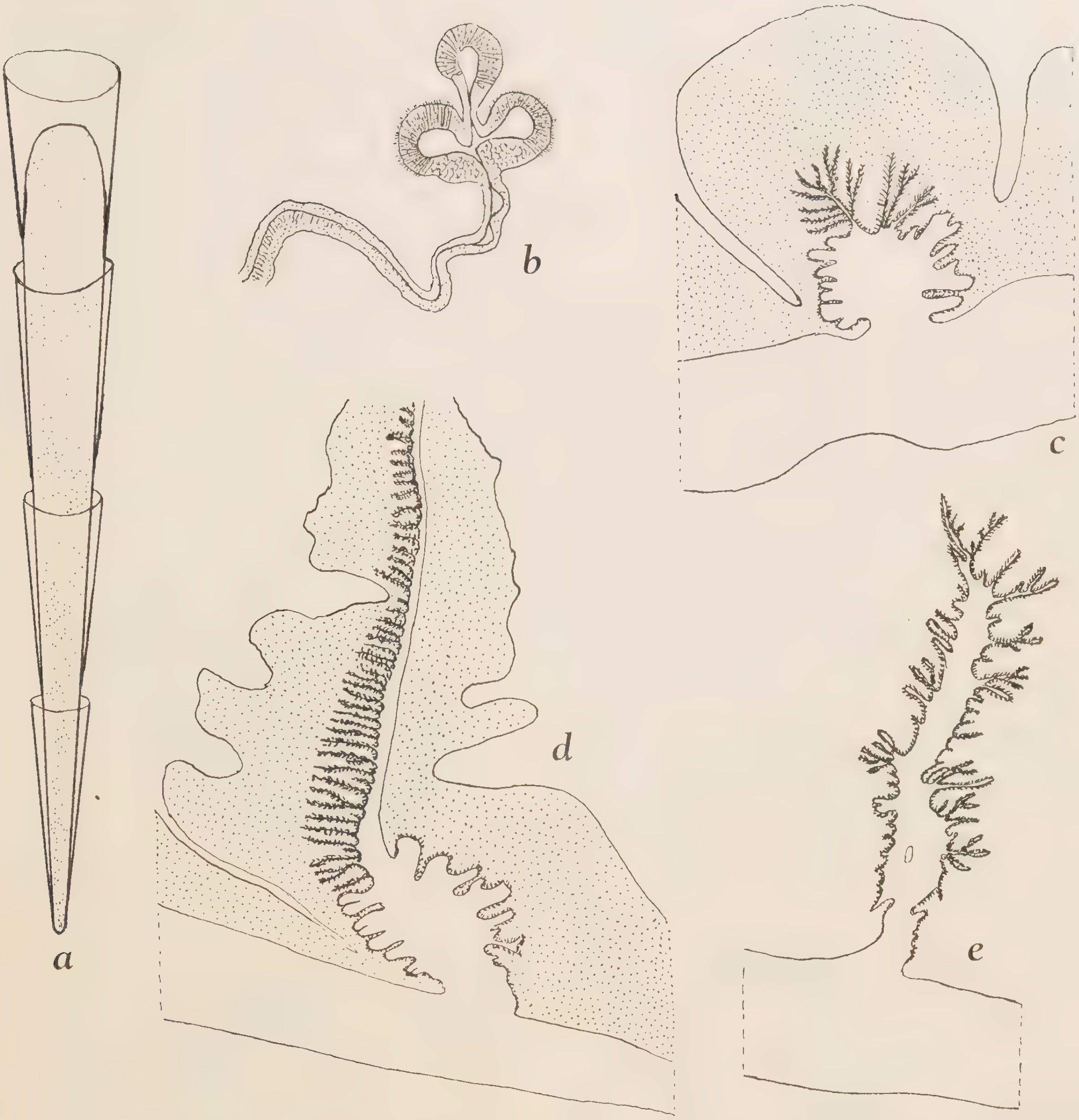

Fig. 2. *Galatheanthemum profundale. a,* schematic figure. *b,* mesentery of first circle, with filament. *c,* mesentery of third circle. *d-e,* mesentery of first circle, in the fertile region and the basal part respectively.

somewhat furrowed in its upper part, indicating the insertions of the mesenteries.

The sphincter is very strong in a sectioned specimen about 0.9 cm long, broad in its upper part, alveolar, but in its lowest thin part with a slight tendency to be reticular. It is completely separated from the endodermal muscles of the column. The tentacles are rather short, about 36 in number. The longitudinal muscles are ectodermal as also the radial muscles of the oral disc. There are two siphonoglyphs and 2 pairs of directives. The mesenteries number about 36. Six pairs are perfect and the arrangement is typically 6+6+6, but one specimen had 6+6+7 pairs. The mesenteries of the last cycle is as a rule developed only on one side of the mesenteries of the second cycle. There is about the same number of mesenteries distally as proximally. In a specimen (length 9.5 cm) with 38 mesenteries in the upper part there are 36 mesenteries present 1.5 cm from the aboral end. The two first cycles of mesenteries are fertile. The retractors of the mesenteries of the two first cycles are diffuse, weak, and in the fertile region set close to the parietal muscle (fig. 2*d*) where they are strongest. Inwards the folds of the muscles diminish in size. The parietal muscles show coarse and few folds on a thick stem of the

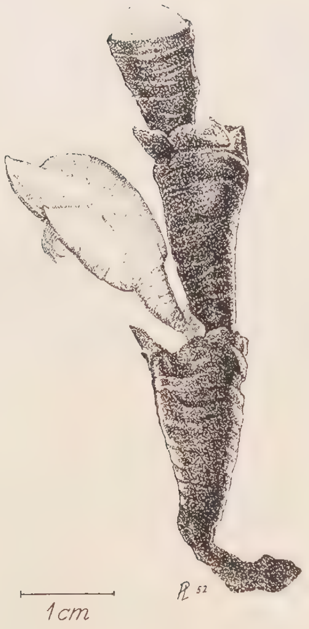

Fig. 3. *Galatheanthemum profundale* from St. 658, with an attached *Scalpellum*. (Poul Larsson del.)

mesogloea (fig. 2*d*). In the lower part of the mesenteries the retractors fuse with the parietal muscles (fig. 2*e*, showing a mesentery of the first cycle). The mesenteries of the third cycle recall the parietal muscles of the other mesenteries, but are on the inside provided with thinner folds, sometimes a little stronger than those which I have drawn in figure 2*c*. The filaments are very well developed on the mesenteries of the two first cycles in the region of the ciliated tract (fig. 2*b*).

The nematocysts of the scapus are partly 22.6-28.2×4.5-5 μ, partly 10-11.3×2.2-2.8 μ, both basitrichs; those of the tentacles 17-24×3-4 μ, sparse, basitrichs; those of the actinopharynx partly 22.6-29.6 × about 4.2 μ, microbasic *p*-mastigophors, partly 22.5-29.6 × 3.5-4.2 μ, very numerous, partly 13.4-19.7 × 2.8-3.5 μ, both basitrichs; those of the filaments partly 22.6-26.8 × 3.5-4.2 μ, microbasic *p*-mastigophors, partly 12-17.6 × 2.2-2.8 μ, basitrichs. The spirocysts of the tentacles are extraordinarily numerous, up to about 70 × 7 μ.

Size: The sectioned type-specimen was 9.5 cm long and 1.2 cm broad in its upper part, but at the base only 0.2 cm. The animals can, however, be a few cm longer.

Type-locality: Galathea St. 658. Type preserved in the Zoological Museum of Copenhagen.

Occurrence: St. 649, 4 large and 4 small specimens. St. 650, about 30 specimens, most of them small. St. 651, 13 small specimens. St. 653, 16 small specimens. St. 654, 11 small specimens. St. 658, about 40 large and medium-sized specimens and many large tubes. Also several tubes from the other stations.

Galatheanthemum hadale n. sp.

Textfig. 4.

This species does not by far attain the size of the geno-type. The body is elongate, cylindrical, but expands considerably at the base and forms a circular plate, as a rule attached to a polished cake of clay somewhat broader than the disc (see *G. profun-*

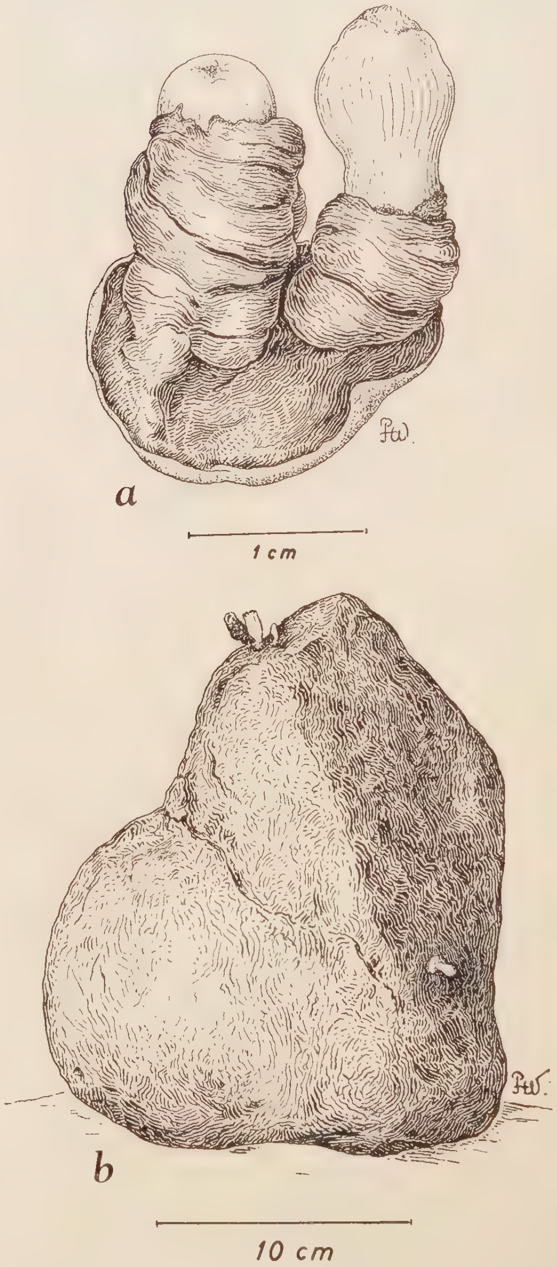

Fig. 4. *Galatheanthemum hadale. a,* the type. *b,* a stone from St. 418 with three small specimens. (Poul H. Winther del.)

dale). The scapus is provided with a rough, thick cuticle, but it is difficult to decide whether this cuticle forms similar tubes as in the type-species, since it is very wrinkled and closed round the lower half of the column (see fig. 4*a*). As far as I can see, however, the animal forms a single tube here. The sphincter is mesogloeal, typically reticular, almost as in *Stomphia coccinea.* The tentacles are rather short and probably 48 in number. The pairs of mesenteries are 24 (6 + 6 + 12) in 3 examined specimens, among them 2 pairs of directives. Only the 6 first pairs are perfect. The retractors are in the fertile region much weaker than in the geno-type, and form no distinct pennons. The longitudinal muscles seem to be best developed in their uppermost part where they form a rather broad band over almost the whole mesentery. Since the muscles are not well preserved I can not give any figure of them. The parietal muscles are of the same appearance as those of *profundale* as also the mesenteries of the third cycle. The two first cycles of mesenteries are fertile. The nematocysts of the scapus seem to be absent, or, if present, very rare; those of the tentacles are 19.7-28 × 2.8 μ, rare, basitrichs; those of the actinopharynx partly 28.2-35.2 × 4.2 μ, microbasic *p*-mastigophors, partly 19.7-28.2 × about 2.8 μ, basitrichs; those of the filaments partly 24-28.2 × 3-5.5 μ, microbasic *p*-mastigophors, partly 22.6-26.8 × 3-4.2 μ, basitrichs. Spirocysts of the tentacles very numerous, up to 78 × 7 μ.

Size: One of the largest samples is 2 cm long and 0.7 cm broad in the upper part, at the base 1.5 cm.

Type-locality: Galathea St. 418. The type (fig. 4*a*) is preserved in the Zoological Museum of Copenhagen.

Occurrence: St. 418, 5 larger and 15 small specimens. St. 419, 4 larger and 14 small specimens. St. 435, 1 large and 1 small specimen.

FAM. ACTINOSTOLIDAE

Hadalanthus nov. gen.

Column more or less cylindrical, divisible into scapus and scapulus. Scapus with numerous papillae forming weak tenaculi, scapulus ridged. Sphincter strong or very strong, mesogloeal. Tentacles rather long, not numerous, up to about 70, their longitudinal muscles ectodermal as also the radial muscles of oral disc. Two well developed siphonoglyphs and two pairs of directives. Six pairs of mesenteries perfect. Retractors strong, diffuse, below the actinopharynx curved to the exocoels in the nondirectives, towards the endocoels in the directives. Parietobasilar muscles weak. Same number of mesenteries distally and proximally.

Dioecious. At least the two first cycles of mesenteries fertile. Cnidom: Spirocysts, basitrichs, microbasic *p*-mastigophors.

It is with some hesitation that I have proposed this new genus since the type-species in some respects agrees with the genus *Daontesia*. I have, however, not found any acontia in the species and I therefore refer the genus preliminary to the Actinostolidae. In this family a genus, *Tealidium,* has mesogloeal papillae (tenaculi?) on the column, but as it has a stinging battery at the base of the outer tentacles and quite a different appearance our genus cannot be identical with it.

Hadalanthus knudseni n. sp.

Textfig. 5.

The three specimens are as to the habitus in comparatively good condition, but the inner organs are not too well preserved. The column is divisible into scapus and scapulus. The scapus is provided with numerous papillae forming tenaculi which are dis-

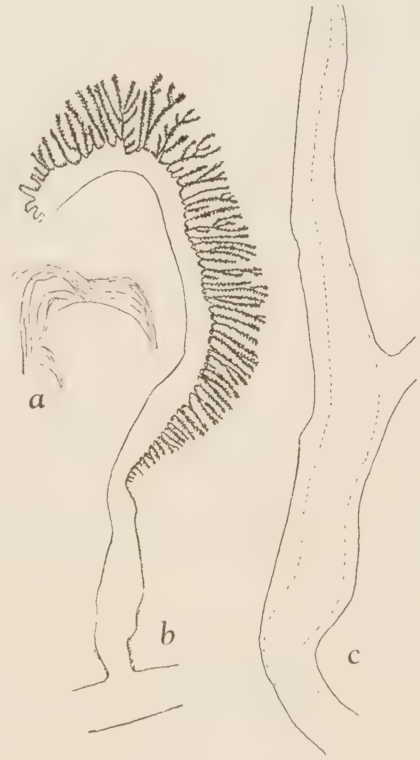

Fig. 5. *Hadalanthus knudseni*. *a*, cuticle of a tenaculum. *b*, section of a directive mesentery. *c*, the extension of the sphincter, the dotted line.

tinctly visible in the smallest specimen and visible in the others too, but owing to the bad preservation I cannot decide whether the ectodermcells are chitinized. The scapulus is short and distinctly ridged. The sphincter is mesogloeal, about 0.5 cm long, occupying a great part of the mesogloea (fig. 5*c*) and completely separated from the endodermal muscles of the body, gradually diminishing in size downwards, in structure principally reticular. The tentacles are rather long, the largest individual has about 70 tentacles, the medium-sized about 48; their longitudinal muscles are ectodermal as also the strong radial muscles of the oral disc. Two well developed symmetrically set siphonoglyphs are present. As far as I can see, only 6 pairs of mesenteries are perfect, among them 2 pairs of directives, (fig. 5*b*). The number of mesenteries is the same proximally and distally. The retractors of the mesentery are diffuse, strong, also present on the mesenteries of the third cycle. Whether pennons are present on the incomplete cycle of the mesenteries of the fourth cycle in the largest specimen I cannot decide. The retractors are curved towards the exocoels in the non-directives, towards the endocoels in the directives, the folds are rather high and branched. The parietobasilar muscles are weak, the basilar muscles distinct. At least the two first cycles of mesenteries are fertile. The nematocysts of the column are 24-32 × 2.8-3.5 μ, basitrichs; those of the tentacles partly 38-43 × 2.8 3.5 μ, partly 48-53.6 × about 5 μ, both basitrichs, partly 39.5-50.8 × 5 μ, microbasic *p*-mastigophors; those of the filaments partly 19.7-24 × 3 μ, basitrichs, partly 23-48 × 4.5 μ, microbasic *p*-mastigophors. Spirocysts of tentacles up to about 50 × 5.6 μ.

Size of the best preserved specimen (the type): Height and breadth about 3 cm, length of the tentacles up to 1.8 cm. Height of the smallest specimen 1.5 cm, breadth 1 cm.

Type-locality: Galathea St. 658. The type is preserved in the Zoological Museum of Copenhagen.

Occurrence: St. 658, 3 specimens.

Remarks: This species is named in honour of Professor MARTIN KNUDSEN, member of the Galathea Committee.

Bathydactylus kroghi n. sp.

Textfig. 6. Pl. 1, fig. 1.

The body is cylindrical, rather elongate; the pedal disc often somewhat invaginated and often broader than the upper part of the body. The column is divisible into scapus and scapulus, the former distinctly furrowed at the insertions of the mesenteries. As all ectoderm of the column is lost it is not possible to decide whether the scapus has been provided with a cuticle. The scapulus forms a more or less distinct wall, on the lower edge of which small tubercles are present. The sphincter is very strong, mesogloeal, completely separated from the endodermal muscles of the column, broad in its upper part, diminishing downwards, alveolar-reticular with coarse mesogloeal meshes. The tentacles are 24 in number, the inner ones are plump and many times larger than the outer ones. The longitudinal muscles, especially of the inner tentacles, are strong, ectodermal; rarely some mucles are enclosed in the mesogloea (fig. 6*a*). The oral disc is radially ridged, its radial muscles are ecto-mesogloeal, usually stronger on the ridges (fig. 6*b*). There are two very broad siphonoglyphs and two pairs of directives.

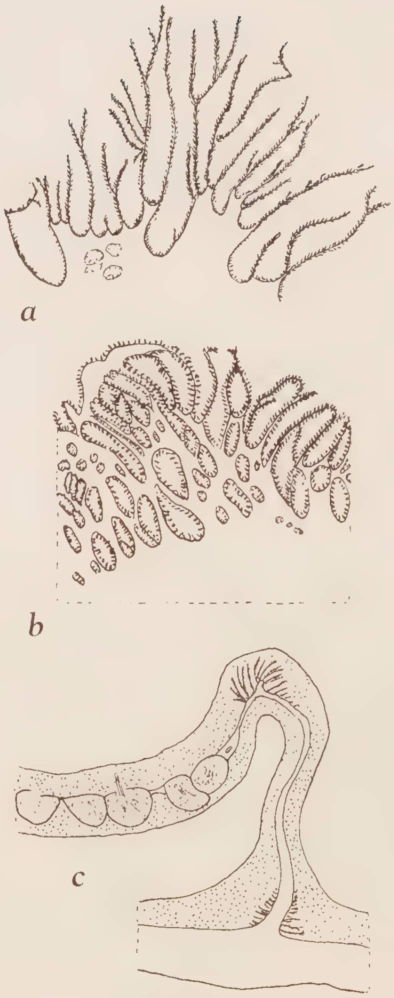

Fig. 6. *Bathydactylus kroghi*. *a*, section of longitudinal muscle of inner tentacle. *b*, section of oral disc. *c*, section of mesentery of second circle in the fertile region.

The pairs of mesenteries are 24 (6 + 6 + 12), the last cycle present only at the base of the body. There are thus more mesenteries proximally than distally. Only 6 pairs of mesenteries are perfect, 12 pairs, incl. the directives, are fertile. The species is dioecious. The retractors of the 12 first pairs of mesenteries are weak and of uniform appearance. At the column is a parietal muscle forming fairly many folds in the reproductive region but few folds towards the base of the body. I have in figure 6*c* drawn part of a mesentery of the second cycle in the fertile region. As far as I can see there are basilar muscles here, at least on the one side of the mesenteries, but they are very weak and sometimes indistinct. The nematocysts of the tentacles are 15.5-22 × 3-3.5 μ, basitrichs; those of the actinopharynx partly 28.2-39.5 × 4.2-5.6 μ, microbasic *p*-mastigophors, partly 28.2-33.8 × 3.5 μ, basitrichs; those of the filaments partly 28.2 38 × 5.6-6.3 μ, microbasic *p*-mastigophors, partly 15.5-2.8 μ, basitrichs, rare. The spirocysts of the tentacles are up to 62 × 5 μ.

Size of the largets specimen (the type): Length 3 cm, breadth 2 cm.

Type-locality: Galathea St. 649. The type is preserved in the Zoological Museum of Copenhagen.

Occurrence: St. 649.12 specimens.

Remarks: I have with some hesitation referred the specimens to the genus *Bathydactylus,* of which hitherto only one species is known, taken in a single, small specimen in the Antarctis at a depth of 4635 m. This species, *valdiviae,* has many characters in common with *kroghi,* as for instance the appearance of the body-wall and of the tentacles, the weak muscles of the mesenteries, the presence of more mesenteries proximally than distally etc., but there are also some minor differences. If we include *kroghi* in the genus *Bathydactylus* the diagnosis of this genus must be slightly amended.

This species is named in honour of Professor AUGUST KROGH, Vice-President of the Galathea Committee.

FAM. BATHYPHELLIIDAE

Daontesia mielchei n. sp.

Textfig. 7.

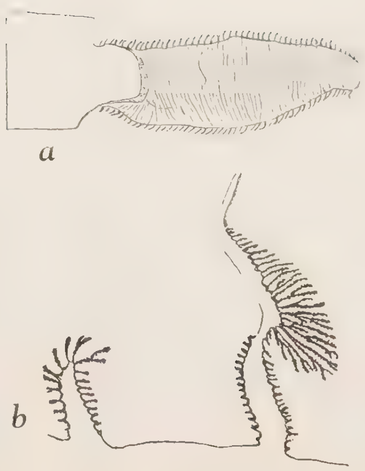

Fig. 7. *Daontesia mielchei. a,* tenaculum. *b,* section of a mesentery of third order and of part of mesentery of first order.

The habitus of the single specimen recalls very much that of *Daontesia praelonga* (CARLGREN 1942, Pl. III fig. 1) from a depth of 1341-1960 m in the North Atlantic. The long scapus is provided with numerous very closely set tenaculi of similar appearance as those of *praelonga* (fig. 7*a*). The short scapulus is longitudinally sulcate. The sphincter is mesogloeal, very strong. In its upper part it diminishes gradually in size; downwards it becomes alveolar-reticular, but the mesogloea between the muscle meshes is rather thick. There are 48 tentacles, hexamerously arranged, their longitudinal muscles are ectodermal. The interior of the animal is not well preserved. In the upper part 24 pairs of mesenteries are present, among these 2 pairs of directives, at the base 48 pairs. The mesenteries of the first and second orders incl. the directives are fertile. The retractors of the stronger mesenteries are diffuse, set near the column and considerably weaker than in *praelonga.* The mesogloea of the mesenteries of the third and fourth cycles is very thick. The figure 7*b* shows a section of a part of a mesentery of the first order and a mesentery of the third.

The nematocysts of the scapulus are 17-19.7 × 3-4 μ, basitrichs, scarce; those of the tentacles, if present, very rare; those of the actinopharynx partly 22.6-31 × about 3-4 μ, basitrichs, partly 22.6-31 × 3.5-5.6 μ, microbasic *p*-mastigophors; those of the filaments partly 25.5-21 × 3 (3.5) μ, basitrichs, partly 25.9-31 × 3-4.2 μ, microbasic *p*-mastigophors; those of the acontia 32.4-42.3 × 3-3.5 μ, basitrichs. (The species probably is provided with acontia; though such could not be isolated; but I have examined the lower part of a mesentery where the acontia, if present, are situated and found here rather numerous basitrichs differing in size from those in the filaments). The spirocysts of the tentacles are large, up to about 70 × 5.6 μ.

Size in contracted condition: Length 3 cm, diameter of the pedal disc 2 cm, that of the upper part 1.5 cm.

Type-locality: Galathea St. 495. The type, the only specimen known, is preserved in the Zoological Museum of Copenhagen.

Remarks: The species is nearly related to *D. praelonga,* but the appearance of the sphincter and the size of the nematocysts are different, and cinclides are apparently absent in our species, which has more mesenteries at the base than in the upper part of the body. I have re-examined *praelonga* as to the number of mesenteries at the limbus. Unfortunately the base of the largest specimen, smaller than the present one, is badly preserved, but one specimen (length 16 mm) had 48 mesenteries at the base. This difference may be of little importance, perhaps the specimen was not fullgrown.

This species is named in honour of Mr. HAKON MIELCHE, in charge of the Information Service of the Expedition.

An unidentified species

At St. 658 13 strongly flattened actiniarians are collected besides *Hadalanthus.* They are in a poor condition and somewhat macerated. The pedal disc is very broad, but the column low. In the largest specimen the diameter of the pedal disc is 5-5.5 cm, the height of the column 2-2.5 cm. There is apparently no sphincter. The tentacles are rather numerous, and their longitudinal muscles are ectodermal. There are two well developed siphonoglyphs. There are apparently many perfect mesenteries; in a smaller specimen I counted about 36. The specimens seem to be fertile. Probably the specimens should be referred to a new genus, but owing to their macerated condition I have given up naming them.

Remarks

The examination of the Actiniaria from the Galathea-Expedition shows that they occur in the greatest depths of the oceans in rather great numbers both as regards number of species and number of specimens. Reproduction must take place in these depths, as evidenced by the presence of well developed fertile organs, especially testes, as also by the multitude of young individuals. Three of the species treated here can be referred to previously known genera from the Atlantic and Antarctic, the others are representatives of two new genera. Of these the genus *Galatheanthemum* is very interesting, not only by the great adaptation of its proximal end to the substratum, but especially by its power to form a tubus by detachment of the outer part of the very strong cuticle from the inner part in the greater length of the scapus, a detachment which can be repeated during the growth of the animal, so that the cuticle appears as two or more tubes inserted into each other. Into this tube the animal can retract the uppermost part of its body. Something similar has never been observed in any actiniarian before.

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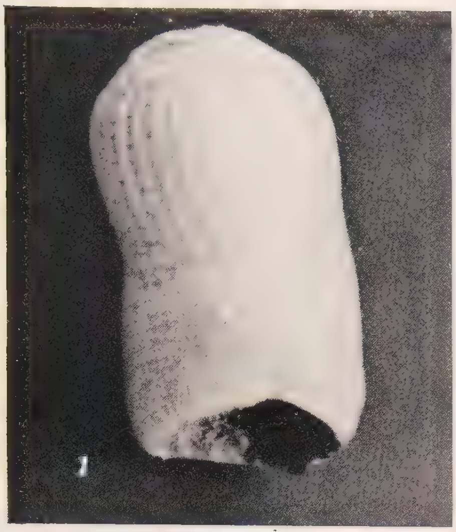
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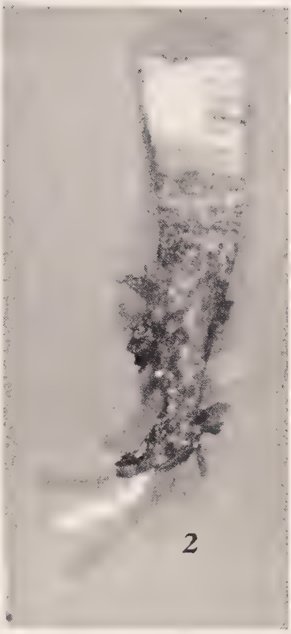
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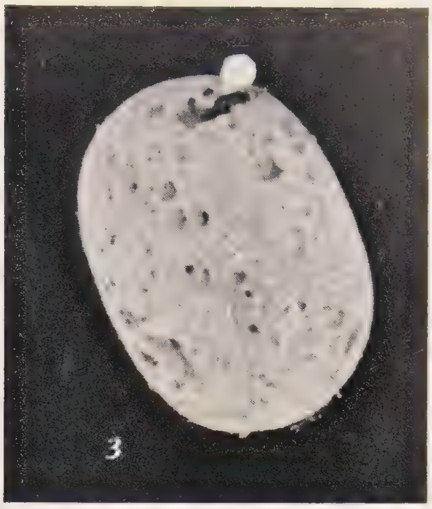
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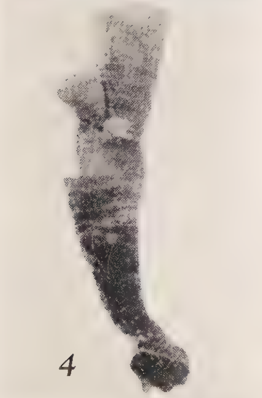
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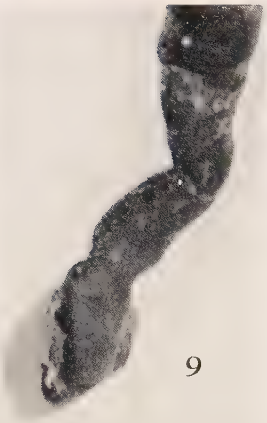
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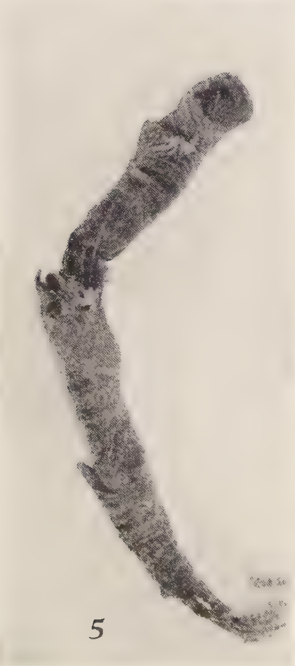
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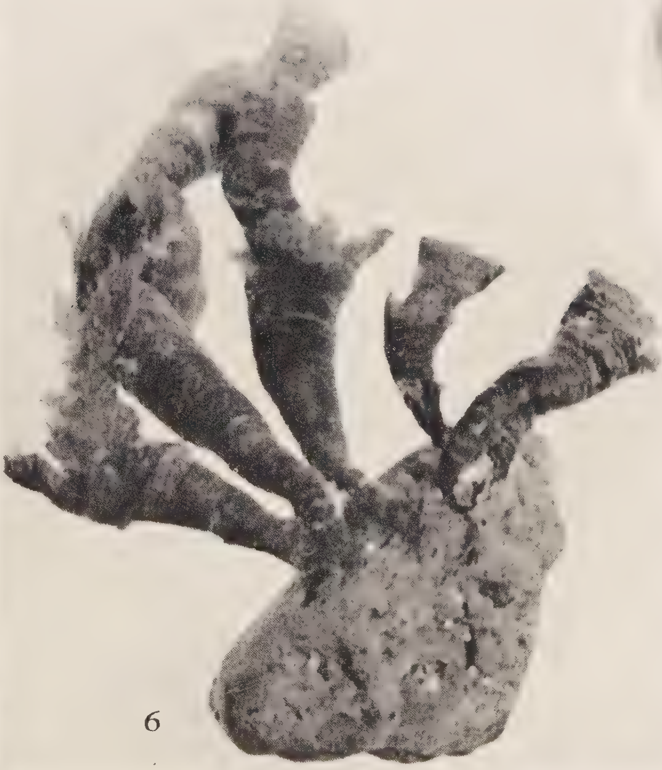
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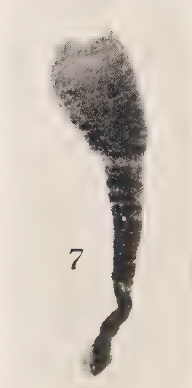
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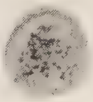
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Fig. 1. *Bathydactylus kroghi*. About 2×. Figs. 2-9. *Galatheanthemum profundale*. Fig. 2. A specimen where the cuticule has been removed in the aboral part of the body to show the thin basal end. About $1^1/_2$×. Fig. 3. A young specimen in a hole of a pumice stone. About $1^1/_2$×. Fig. 4. Two specimens, the one considerably smaller than the other and attached to the larger after the second tube had been formed by the larger specimen. About natural size. Fig. 5. A specimen forming four tubes. Slightly reduced. Fig. 6. Specimens attached to a stone and forming a different number of tubes. Only in the largest specimen (length of the tube 12 cm) the animal is present, in the other 5 the animals are lost or have died and been dissolved. Fig. 7. A specimen with a cake of lime at its base. Slightly magnified. Fig. 8. A cake of lime seen from the part where the animal is attached to it. Nat. size. Fig. 9. The lower part of the specimen of figure 7. Magnified.

HYDROIDS

FROM DEPTHS EXCEEDING 6000 METERS

By P. L. KRAMP
Zoological Museum, Copenhagen

The hydroids found by the "Galathea" Expedition at depths exceeding 6000 m were very few, and they were in a more or less fragmentary condition, which was not astonishing considering the great technical difficulties connected with trawlings at such enormous depths. Only by an extremely careful examination of the meshes of the trawl was it possible to detect and secure these delicate creatures, and apparently none of the large colonies, as we know them in more shallow areas, were present on the clayey bottom of the deep trenches examined by the Expedition. Nevertheless, the few specimens found are of considerable interest, because no hydroids have ever been taken at such depths before, the maximal depth up to now being 5304 m. Altogether five species were found, two of them are only represented by indeterminable fragments, one is certainly a new species *Halisiphonia galatheae,* one is provisionally described as a new species *Aglaophenia (?) galatheae,* and one may with some probability be referred to *Aglaophenia tenuissima* Bale, previously known from the Great Australian Bight.

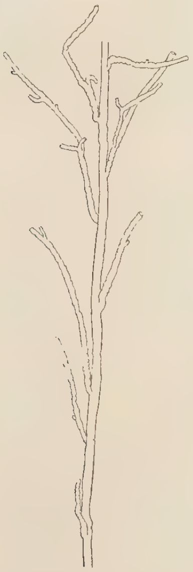

Fig. 1.

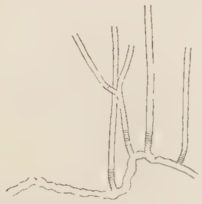

Fig. 2.

Fig. 1. Undetermined athecate hydroid. Kermadec Trench, St. 654. × 9.

Fig. 2. Undetermined thecaphore hydroid. Kermadec Trench, St. 654. × 9.

Fig. 1 shows the racemous hydrocaulus of an athecate hydroid; the perisarc is very thin and delicate, somewhat wrinkled; no hydranths or gonophores are present. It was taken in the Kermadec Trench, at St. 654, 32°10'S. 175°54'W., 18th February 1952, depth 5800 m, bottom brown clay with pumice, to a piece of which the colony was attached.

On another piece of pumice from the same locality was a stolon with some pedicels, annulate at their bases, evidently belonging to some thecaphore hydroid; it is seen in fig. 2.

Halisiphonia galatheae n. sp.

Textfig. 3.

Stat. 649, Kermadec Trench, 35°16'S. 178°40'W. 14th February 1952, depth 8210-8300 m, bottom gray clay with pumice.

From an open net of very thin and delicate stolons issue a considerable number of long pedicels, very thin and completely smooth apart from some irregular wrinkles at their base, many of them more than 20 mm, some as much as 25 mm long. The pedicels are about 0.08 mm in width and pass gradually into the very elongated, funnel-shaped hydrothecae, the aperture of which is about 0.4 mm. The length of the hydrothecae may be estimated as about 1.2 mm, but it cannot be measured exactly, because the hydrotheca is not distinctly limited from the pedicel. A very slight internal thickening may sometimes indicate the base of the hydrotheca, and in a few cases an extremely delicate diaphragm may be discerned. The aperture is not everted. Renovation occurs rather frequently, and two, three or four hydrothecae may be seen inside each other,

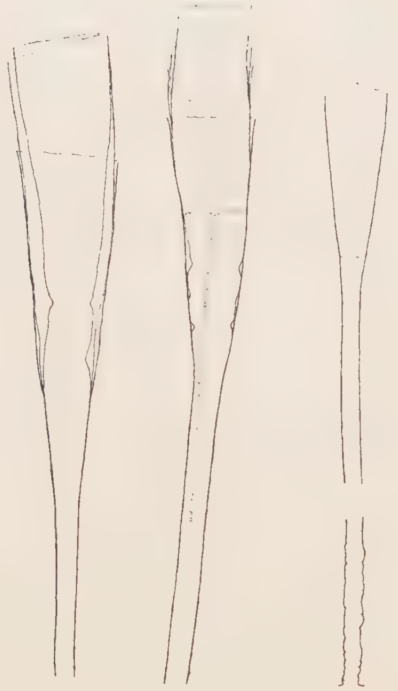

Fig. 3. *Halisiphonia galatheae* n. sp. Kermadec Trench, St. 649. × 30.

but as a rule the extremely delicate walls are more or less torn. No gonothecae were present.

Four other species of *Halisiphonia* have been described, all of them from deep water. The history of the genus has previously been dealt with by me (Kramp 1932 p. 40). *H.arctica* Kramp (1932) from Baffin Bay, 1200 m, is distinguished from all the other species by the basal part of the pedicels being spirally coiled and by the hydrotheca margin being distinctly everted. In *H.nana* Stechow (1921 and 1925) the hydrothecae are small, about 0.45 – 0.6 mm long, and borne upon very short pedicels; it was found east of Bouvet Island in the Antarctis at a depth of 457 m. *H.megalotheca* Allman (1888), which was described from very deep water, 4750 m, south of Australia and later recorded from the neighbourhood of St. Paul in the southern part of the Indian Ocean, 672 m (Stechow 1925) resembles the present species in shape and size of the hydrothecae, but the pedicels are much shorter, 0.74-1.20 mm, and renovation of the hydrothecae was not observed. *H. spongicola* Haeckel (1889) from the central and northern Pacific, 4200-4750 m, is similar to *H. megalotheca,* but differs from it in the shape of the gonothecae. The present species *H. galatheae,* is mainly characterized by its very long pedicels in conjunction with the frequent renovation of the hydrothecae and the non-everted hydrotheca margin.

Aglaophenia tenuissima Bale

Textfigs. 4 and 5.

Stat. 658, Kermadec Trench, 35°51′S. 178°31′W. 20th February 1952, depth 6660-6720 m, bottom brown sand with clay and stones. One sterile colony.

The colony, which is somewhat mutilated, is 13 cm high and has been attached to the clayey bottom by a large basal tuft of branched and intertwined stolons. The stem is fascicled, 2 mm in diameter near its base; three lateral branches have been present, but only the uppermost is retained, and all the hydrocladia are broken short, so that only the first

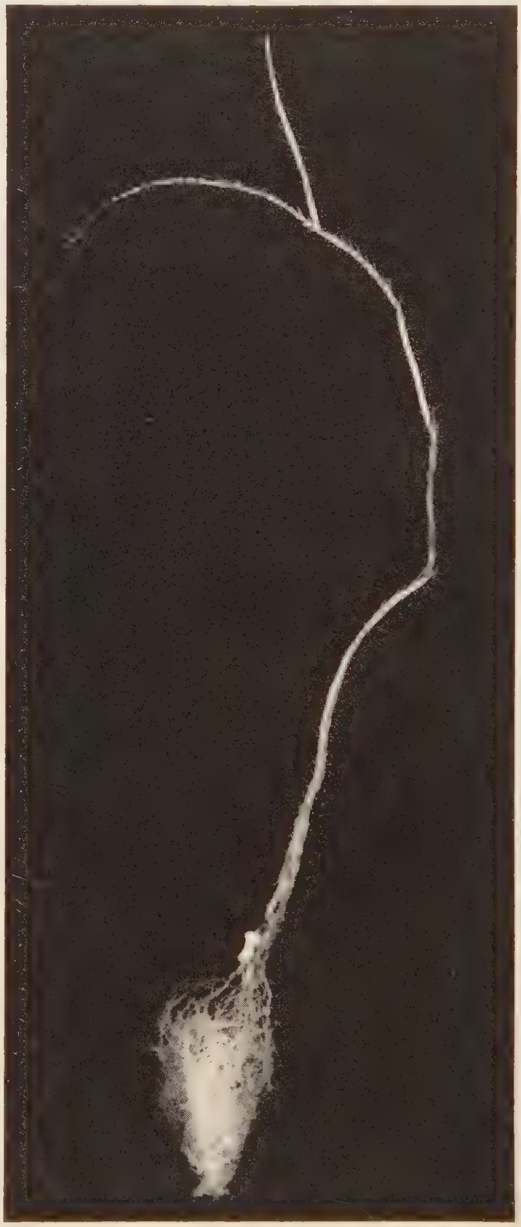

Fig. 4. *Aglaophenia tenuissima* Bale. Entire colony. Kermadec Trench, St. 658.

2-5 hydrothecae are left, in one instance as many as seven. The stem and the primary branches carry no hydrothecae, but longitudinal rows of sarcothecae separated by about their own length or a little more. Hydrocladia arise not merely from the primary branches, but also the main stem carries some scattered hydrocladia.

The hydrocladia arise alternately in one plane from a frontal tube which is not divided into internodes; it carries a sarcotheca immediately below and above each hydrocladium. The basal node of each hydrocladium is short and carries a sarcotheca but no hydrotheca. The internodes of the hydrocladia are separated by a distinct, ring-shaped constriction, but no internal septum; each of them carries a hydrotheca with a mesial and two lateral sarcothecae.

The hydrothecae are about 0.27 mm in length and a little more than half as wide at the aperture, the base is broadly rounded, the abcauline wall almost parallel to the internode or a little diverging upwards, slightly convex; the aperture is somewhat oblique, its angle with the internode rather variable; the median tooth is pointed, but not very prominent; the lateral teeth are short and broad, three on each side are distinct, a fourth, adcauline tooth slightly indicated. The intrathecal ridge near the bottom of the hydrotheca is faintly developed, and there are two septal ridges in the internode, one opposite the intrathecal ridge, the other at the base of the lateral sarcothecae. The mesial sarcotheca is about half as long as the hydrotheca, adnate throughout its length, canaliculate, without any distal projection; its base is separated from the internode by an incomplete septum, and halfway up its abcauline side is an internal, oblique ridge. The lateral sarcothecae are small, backward curved, with an abcauline transversal ridge in the middle portion, projecting about halfway above the margin of the hydrotheca.

Gonosome not present.

This specimen agrees in all essential features with *Aglaophenia tenuissima*, which was taken by the "Endeavour" in two localities in the Great Australian Bight at depths of 293 and 348-585 m and was thoroughly described by BALE (1914 p. 179, pl. 37 figs. 1-2). There is also agreement as to the way in which the branches of the colony are developed, with one exception. In *A. tenuissima* "the stem is formed primarily by the proximal portions of a succession of alternate branches. The primary shoot, after giving off a lateral branch, continues on its course for perhaps an inch or two, bearing hydrocladia, and then terminates; the lateral branch then becomes the axial one, growing for some distance . . . without hydrocladia, . . . it then in turn gives off a lateral branch on the opposite side to that on which it commenced, after which it produces hydrocladia, while the new lateral branch takes up the role of continuing the axial column." – So far the agreement is complete. But BALE further adds: "A lateral offshoot is much slenderer at its origin than the branch from which it springs, but it grows thicker upwards till at the next furcation it is as thick as its predecessor." In the present colony the lateral branches, which in succession constitute the actual, thorough-going stem, become gradually thinner upwards, and the base of each branch consists of continuations of the tubes of the preceding portion. In spite of this slight difference in the formation of the branches it seems to me most probable that the colony from the Kermadec Trench belongs to the same species as that described by BALE from the Australian Bight.

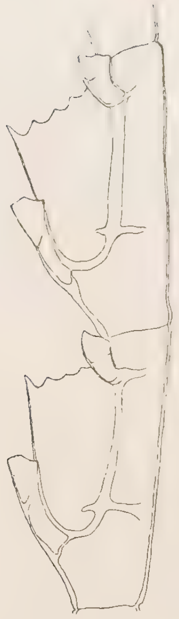

Fig. 5. *Aglaophenia tenuissima* Bale. Hydrothecae. Kermadec Trench, St. 658. × 75.

Aglaophenia (?) galatheae n. sp.

Textfigs. 6 and 7.

Stat. 465, Java Deep, 10°20'S. 109°55'E. 5th September 1951, depth 6930-7000 m, bottom bluish clay. One sterile colony.

The colony is 10 cm high, with a small basal tuft of intertwined stolons. The stem is fascicled, but thin, about 0.25 mm at the base, unbranched, without hydrothecae, but with rows of sarcothecae separated by about twice their length.

Hydrocladia alternate, distantly placed in the lower portion of the stem, in the upper portion regularly arranged at distances of about 2.5 mm on each side, issuing at very acute angles, the longest hydrocladia 16 mm in length with 34 hydrothecae. The basal joint, which arises from a tiny apophyse, carries a hydrotheca. The internodes are very indistinctly separated by a mere indication of an annular furrow opposite the aperture of the hydrothecae.

The hydrothecae are very elongate, about 0.33 mm in length, the sagittal width of the aperture less than half the length of the hydrotheca. The bottom of the hydrotheca is narrow, the abcauline wall slightly convex. The aperture is perpendicular to the internode, the median tooth is small and pointed, and there are four low and blunt teeth on each side. An intrathecal ridge is slightly indicated, and the two septal ridges in the internode are likewise very insignificant, one a little above the intrathecal ridge, the other at the level of the bottom of the lateral sarcothecae. The mesial sarcotheca is small, hardly reaching to the lower one-third of the wall of the hydrotheca, adnate throughout its length, canaliculate, with a faintly developed median tooth; there is only a very slight indication of an internal ridge at the bottom of the sarcotheca, or none at all. The lateral sarcothecae are small, and they do not reach the level of the aperture of the hydrotheca.

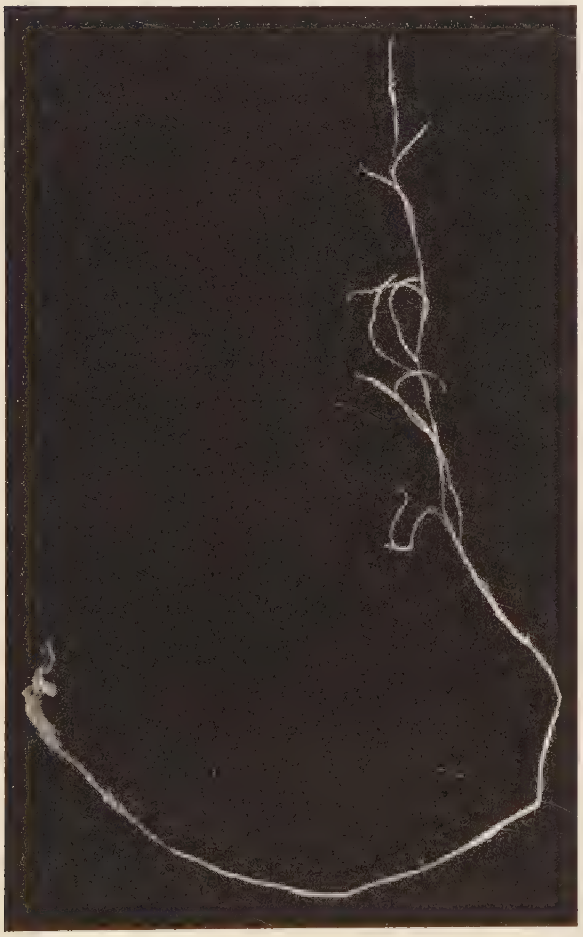

Fig. 6. *Aglaophenia galatheae* n. sp. Entire colony. Java Deep, St. 465.

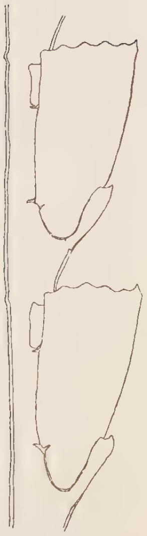

Fig. 7. *Aglaophenia galatheae* n. sp. Hydrothecae. × 75.

Since no gonosome is present, the genus cannot be determined with certainty. I had to look through the descriptions of all known species of Aglaopheniids, and I found no species to which the present specimen could be referred. I therefore describe it provisionally as a new species.

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PRIMNOELLA KRAMPI N. SP.

A NEW DEEP-SEA OCTOCORAL

By F. JENSENIUS MADSEN
Zoological Museum, Copenhagen

The Octocoral described in this note under the name of *Primnoella krampi*[1] belongs to the Primnoellidae within the Gorgonacea. The depth at which it was collected, 5850 m, is the greatest depth hitherto recorded for any Gorgonacean. Another group of Octocorals, the Pennatulacea, was recorded by the Galathea Expd. from a still greater depth, 6620 m, St. 650 in the Kermadec Trench, but the specimen collected, an *Umbellula,* is too juvenile to be identified to species.

Diagnosis:

Species of *Primnoella* with small, unbranched, flexible colony with disk-like attachment. Zooids ascending and placed opposite in pairs or in whorls of three. Intervals between successive groups of zooids about 1.4 to 2 mm. Verrucae cylindrical, 1 to 1.5 mm in length, and with 8 longitudinal rows of scales. Circumopercular scales the largest, oval, up to 0.4 mm long, and completely covering the distinctly smaller opercular scales. Scales of zooid body rounded, 0.2-0.25 mm in diameter; numbering 4 in the adaxial and 7-8 in the abaxial rows. Stem with a single layer of rounded scales of about 0.2 mm in diameter. These scales mostly with the distal, free part turned outwards, and the scales of the zooid body often with a similar tendency.

Type-locality:

Galathea St. 654. Kermadec Trench, 32°10′S., 175°54′W., 5850 m.

The type is preserved in the Zoological Museum of Copenhagen.

Description:

The single colony collected is unbranched and measures in intact condition 58 mm in length. The basal disk is rounded, about 2-$2^1/_4$ mm in diameter, and covered with scales. It is unknown to what the colony was attached when alive. The stem is about 0.3 mm in diameter at the base and keeps this diameter almost to the tip of the colony. The axis measures about 0.1 mm in diameter at the base and tapers gradually to the tip. The axis is dark brown and distinctly seen through the coenenchyma and the thin scales, otherwise the colony is white. The colony is erect, but the stem is very flexible. The zooids are mostly arranged opposite in pairs, but may be found in whorls of three. In all, 30-31 groups of zooids are present, of which the fifth group from the base, a few of the medium ones, and the eighth from the tip consist of 3 zooids. The pairs of zooids are not arranged in the same plane, but this turns irregularly along the stem, sometimes as much as 90° between two successive pairs. The colony is somewhat damaged, the coenenchyma of the stem with the zooids being pushed together in the major part along the stem and the axis thus laid bare for a length of about 2 cm. The lowermost group of zooids is placed 1.5 mm above the base and thereafter the zooids rise from the stem at intervals generally of about 1.4 -2 mm, but sometimes only 1 mm. The stem is covered with thin, rounded, about 0.2 mm large scales, most of which have their distal part turned distinctly outwards. The distalmost 0.6 mm of the colony is naked, consisting of the pointed axis covered only by a thin layer of coenenchyma. There is no inner layer of differently formed sclerites.

The zooids are cylindrical, ascending, and usually closely pressed against the stem. They are covered by 8 longitudinal rows of imbricating scales. The circumopercular scales are the largest, irregularly oval, and up to 0.4 mm in length. The opercular scales, which are completely covered by the circumopercular scales, are also oval, but distinctly smaller. The scales of the zooid body are rounded, usually about 0.25 mm in diameter, and number 4 in the adaxial rows and about 7-8 in the abaxial rows. All the scales are thin, smooth on the outside, but on their inside provided with a number of fairly large warts. The distal border of the scales of the stem and zooid body, and the whole distal half of the circumopercular scales, however, are smooth also on the inside. The distal end of the scales of the zooid body sometimes have a tendency of being outwards bent as was the case with the stem scales. The length of the contracted zooids – the verrucae – varies from about 1 to about 1.5 mm, those of the distal part of the colony in general being the largest. The fifth distalmost pair of zooids consists of only two very small buds, and the seventh distalmost pair of zooids also is not fully developed.

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[1] Named thus in honour of Dr. P. L. Kramp, Director of the department of marine invertebrates of the Zoological Museum of Copenhagen, and member of the scientific party of the Galathea-Expedition.

Remarks:

The present form is closely related to *Primnoella jungerseni,* collected in the Irminger Sea, between Greenland and Iceland, by the Danish Ingolf-Expedition (Madsen 1944, Rep. Dan. Ingolf-exp. 5, 13, pp. 39-42, figs. 30-31). The size and general appearance of the two forms are the same, and they agree closely also in most details. The verrucae of the colony from the Kermadec Trench are a little smaller than those of the North-Atlantic colonies, 1-1.5 mm as against 1.5-2 mm; but the only character which makes me regard the present form as representing a new species is the outwards bending of the scales of the stem, which gives this colony quite another appearance – under the microscope – than have the colonies of *P. jungerseni,* which have all the scales closely appressed.

Primnoella krampi and *P. jungerseni* form morphologically a group of their own within the genus *Primnoella,* and they are distinguished also in zoogeographical respect since both of them are deep-sea species, *P. krampi* taken at a depth of 5850 m and *P. jungerseni* at 2137 m and 2448 m respectively, whereas the other members of the genus are confined to depths less than about 1100 m, some of them even occurring at depths of only about 15 m.

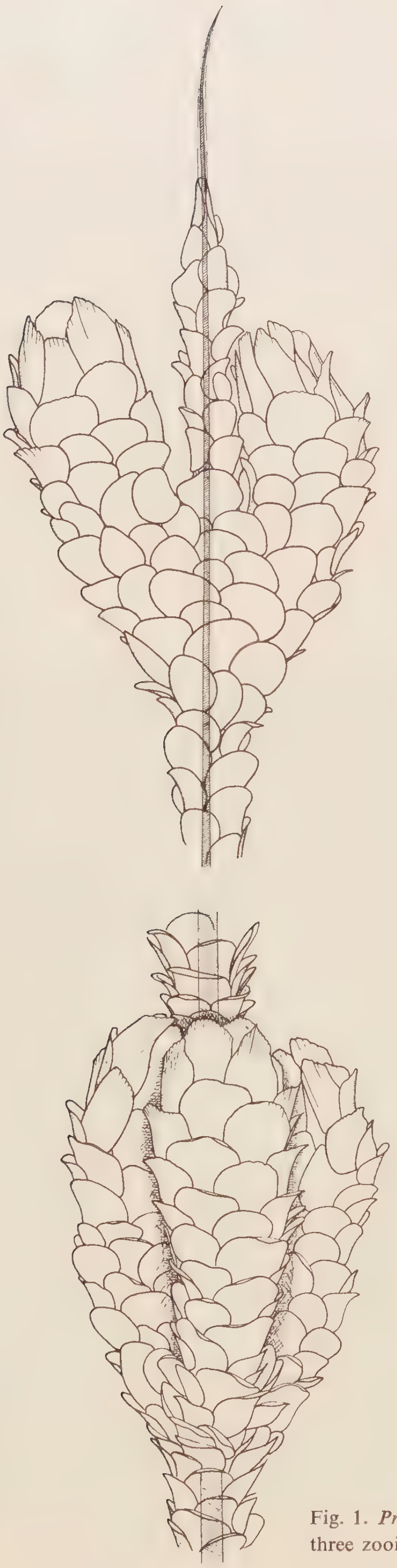

Fig. 1. *Primnoella krampi* n. sp. The distalmost pair of zooids, and a whorl of three zooids (the eighth group from the tip of the colony). About 40 × nat. size.

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ECHINOIDEA, ASTEROIDEA, AND OPHIUROIDEA

FROM DEPTHS EXCEEDING 6000 METERS

By F. JENSENIUS MADSEN
Zoological Museum, Copenhagen

ECHINOIDEA

Irregularia

POURTALESIIDAE

Pourtalesia sp., ? aurorae Koehler 1926.
Textfig. 1.

Pourtalesia aurorae KOEHLER 1926, pp. 43–48, pls. 105_{1-8}, 121_3.

Galathea St. 495. Banda Trench, 5°26′S, 130°58′E, 7250-7290 m. – Many small fragments.

This record represents the hitherto deepest made find of any Echinoid, but unfortunately the specimens were so badly damaged in the trawl that only a heap of small, deep violet fragments are left. The fragments are of a Pourtalesiid with subanal rostrum, but otherwise nothing definite can be said about the shape of the specimens when intact. The size may have been about 3-5 cm. The number of specimens can not be stated, but besides a fragmentary subanal rostrum there are also fragments of two periprocts. A number of smooth primary spines, up to 7 mm long, are preserved and there are numerous secondary, very small spines of about 0.7 mm in length. A few large ophicephalous pedicellariae (fig. 1*a, b)* and also a few rostrate ones (fig. 1*c, d)* were found on the subanal rostrum. The ophicephalous pedicellariae have valves about 0.6 mm long and provided with 4 teeth. One of these pedicellariae appeared to be 4-valved because one of the valves was bifurcate. The valves of the rostrate pedicellariae are about 0.2 mm.

The ophicephalous pedicellariae show that the fragments belong to a species of *Pourtalesia,* but they are, on the other hand, somewhat different from those hitherto known, viz. from *P. miranda* A.Ag. (incl. *P. wandeli* Mrtsn), *P. jeffreysi* Wyv. Th., *P. alcocki* Koehler, and *P. laguncula* A.Ag., the ophicephalous pedicellariae of these species all having a large number of teeth. Ophicephalous pedicellariae are unknown in the other species of *Pourtalesia* described, but among these *P. tanneri* A.Ag. have rostrate pedicellariae different from those of the present species; and *P. hispida* A.Ag., the rostrate pedicellariae of which would seem to be like those of the present fragments, have primary spines with min-

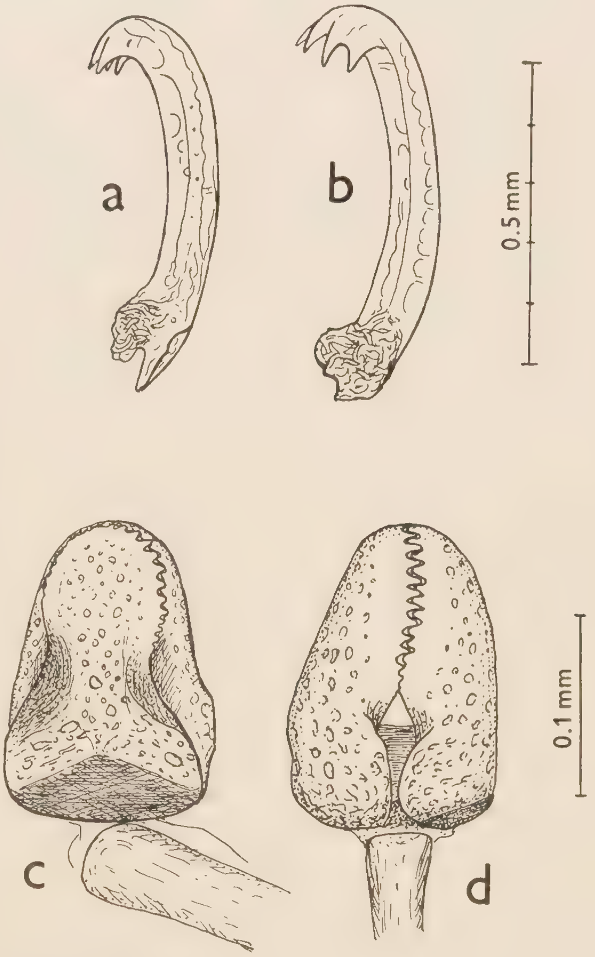

Fig. 1. *Pourtalesia sp.,? aurorae* Koehler. *a-b,* valves of ophicephalous pedicellariae. *c-d,* rostrate pedicellariae from subanal rostrum.

ute thorns whereas those of the present species are smooth. *P. debilis* Koehler have both rostrate pedicellariae and primary spines as those of the Galathea fragments, but its colour is stated to be "gris clair" (in alcohol), whereas the present fragments have retained their deep violet colour also in alcohol.

Then *Pourtalesia aurorae* Koehler remains, and it is very unfortunate that ophicephalous pedicellariae are not known from this species, since the Galathea fragments seem to agree with it in other characters. The rostrate pedicellariae and the primary spines are similar and so is the colour, which in fresh specimens of *P. aurorae* was recorded to be 'reddish-brown' and "d'un violet très foncé" in alcoholic specimens. The affinity of the present fragments with KOEHLER's *Pourtalesia aurorae* would thus seem probable, and I record them, therefore, with a query under this name. Only a possible future knowledge of the ophicephalous pedicellariae of good specimens of *P. aurorae* can, however, decide whether the Galathea specimens actually belong to this species.

Distribution:

Pourtalesia aurorae has been recorded from three localities in the Antarctic Sea, about 63°-65°S. and 95°-102°E., at depths of 440 to 1690 m, whereas the Galathea specimens were taken in the Banda Sea at a depth of about 7270 m. The species has a very wide bathymetrical distribution – provided that the identification is correct – although not extraordinarily wide, since e. g. the Atlantic *P. miranda* A.Ag. has a range from about 500 to 5860 m.

OPHIUROIDEA

OPHIOLEPIDAE

Ophiura loveni (Lyman 1878)

Textfig. 2. Pl. 1, figs. 5-10.

Ophiuroglypha loveni LYMAN 1878 p. 80 pl. $4_{109-111}$.
Ophiuroglypha loveni LYMAN 1882 p. 53 pl. 8_{1-3}.

Galathea St. 658. Kermadec Trench, 35°51'S., 178° 31'W., 6660-6720 m. – 177 specimens.

The specimens vary in diameter of disk from 8 mm to 18 mm, and most of them measure 14-15 mm. Only a few specimens had some of the arms preserved, and the distalmost tip of the arms is always missing. Probably nearly complete arms measured 45 mm, both in a specimen 11 mm in disk diameter and in another one 16 mm in disk diameter. The longest detached arm measures 58 mm. The shape of the disk varies from pentagonal with the sides concave to circular.

These specimens clearly belong to the species *O. loveni* described by LYMAN, 1878, on specimens collected by the Challenger Expedition in the southern Indian Ocean at depths from 2510 to 4755 m. The present large series of specimens shows, however, a fairly wide range of variation. This variation is partly illustrated by the accompanying figures, fig. 2 *a* and *d*. Fig. 2 *a* shows the oral aspect of a specimen, 15 mm in disk diameter, which agrees fairly well with the somewhat larger type-specimen figured by LYMAN in 1878, pl. $4_{109-111}$. The Galathea specimen has the ventral interradial area covered by numerous small scales as has the type, and also its dorsal side agrees with that of the type, being covered with even more numerous and smaller scales than orally. The second specimen figured here, fig. 2*d*, has fewer and therefore also larger scales both orally and aborally; and other specimens may have still fewer scales.

The shape of the oral plates varies from pentagonal with the inner sides concave, as the left one of fig. 2*a*, to broad oval, as in fig. 2*d*. Oral plates of a distincly broad arrowhead shape may also be found, but these probably are abnormal. The adoral plates follow the inner angle of the orals, and consequently the jaw plates vary in shape from rhomboidal to triangular. The number of mouth papillae is usually 6 or 5, but there may be 7 or, as an abnormality, only 3 small, scattered ones. Very often 2 or 3 of the basal mouth papillae are fused together into one large papilla so that the number of papillae becomes 5 or 4, and exceptionally only 3. One distal, large and triangular tooth is the rule, but there may be 2 smaller teeth. The shape of the ventral arm plates is also varying; the second plate may thus vary from completely square to nearly triangular. From the fourth or fifth plate the shape becomes broad oval with a peak inwards. Usually only the first two ventral arm plates are in contact, but also as many as 5 plates may be contiguous, as shown in fig. 2*e*. The number of arm spines proximally is 5 or, more commonly, 6. None of the arm spines of the present specimens are modified into hooks. The number of tentacle scales in the proximal pores varies from 3 to 8, and is generally the same on either side of the pore, but may be fewer on the

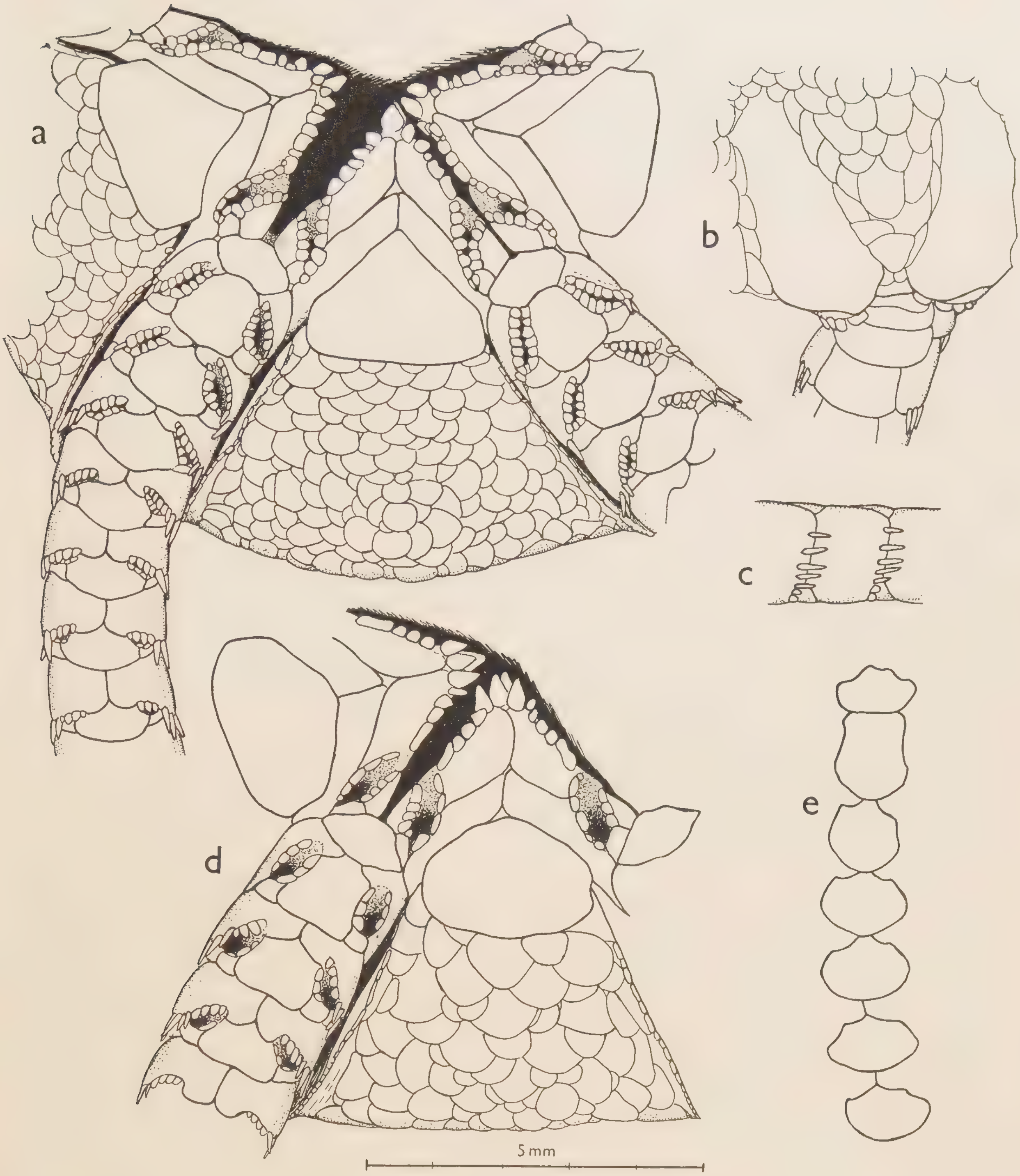

Fig. 2. *Ophiura loveni*. *a*, oral aspect of a typical specimen; *b*, radials and armbase of same; *c*, arm of same seen from the side. *d*, oral aspect of a specimen with large interradial scales and oral plates of a rather unusual shape. *e*, ventral armplates of a specimen in which rather many of them are contiguous.

inner side, where also sometimes only 1 scale is present. The shape of the radial plates varies from long oval, as in fig. 2*b*, to equilaterally triangular. The primary plates are not always easily distinguished, and sometimes they are pushed out as far as the radials. The wedge of scales separating the radial plates (cf. fig. 2*b)* usually comprises a fairly large number of subequal scales, but one scale may be considerably larger than the others, triangular, and almost alone filling up the wedge.

The colour of the specimens when alive was greyish.

Some of the specimens contained 1 mm large embryos.

Those of the present specimens which have fairly large and few scales on the dorsal side and in the ventral interradius are intermediate between the typical *O. loveni* and LYMAN's *O. irrorata,* the type of which was taken off S. Africa at a depth of 3475 m (LYMAN 1878 p. 73 pl. $4_{106-108}$; 1882 p. 47 pl. 5_{7-9}). Since the days of the Challenger Expedition a great number of deep-sea ophiuroids from widely scattered localities in the oceans have been referred to *Ophiura irrorata,* and some authors have also regarded a number of later described species as synonyms only of this species. Curiously enough, however, *O. loveni* has never been mentioned among the possible synonyms. MORTENSEN in 1933 p. 86 gives a list of the synonyms, and incidentally points out that H. L. CLARK, and KOEHLER (in his latest papers) went too far in including also KOEHLER's *O. mundata* among them.

MORTENSEN mentions, as one of the characters of *O. irrorata,* the peculiar "extra plate at each outer corner of the ventral plates in the basal part of the arm". This plate is found also in the present material, and is indicated in LYMAN's figure of *O. loveni,* 1882 pl. 8_1, though not in his figure from 1878. It is found, however, in a specimen of *O. loveni* from the Challenger St. 146, identified by LYMAN, which I have had for comparison. MORTENSEN sees in this plate the excessively developed distal tentacle scale; but in the present material the plate itself often bears one or a few tentacle scales, as shown in the portrayed specimens.

The Challenger specimens of *O. loveni* and those collected by the Galathea differ from the type of *O. irrorata* in having more numerous and smaller scales on the dorsal side and in the ventral interradius. Of the species referred as synonyms to *O. irrorata,* the following two, *O. orbiculata* (Lyman), from the Eastern Pacific, and *O. involuta* (Koehler), from the Indian Ocean, agree with *O. irrorata* in the size of the scales, while *O. integra* (Koehler) and *O. figurata* (Koehler), both from the Antarctic Atlantic, and *O. irrorata* var. *polyacantha* Mortensen, from the North Atlantic, agree with *O. loveni,* and *O. tumulosa* (Lütken & Mortensen), from the Eastern Pacific, is intermediate. It is evident that *O. loveni* is at least very closely related to *O. irrorata,* and possibly it cannot be kept specifically distinct. At present, however, I have thought it best to record the specimens collected by the Galathea under the name of *O. loveni,* to which identification there can be no objection.

Distribution:

O. loveni undoubtedly is widely distributed in the deep-sea. The Challenger specimens were from the southern Indian Ocean, and the nominal species which in the above are considered belonging to *O. loveni* were taken in the Atlantic, in the Antarctic part and near Greenland respectively. One of the Challenger localities was south of Australia, and the Galathea specimens were taken near that area, north of New Zealand. The bathymetrical range of *O. loveni* is from about 2500 to about 6700 m. *Ophiura irrorata* to which *O. loveni* may eventually be referred has a bathymetrical range of from 400 to 5870 m.

Ophiuroid indet.

Galathea St. 650, Kermadec Trench, 32°20'S., 176° 54'W., 6620 m. – An arm-fragment.

When the trawl came up from this station an arm-fragment of an ophiuroid was found in the meshes. It is the distal part of an arm and is thus quite unidentifiable. Its mention here is justified only by the great depth from which it came.

ASTEROIDEA

PORCELLANASTERIDAE

Eremicaster pacificus (Ludwig 1905).

Porcellanaster pacificus LUDWIG 1905 pp. 89-92, pl. 6_{28-29}.
Eremicaster pacificus FISHER 1911 pp. 29-31, pl. 2_{1-3}.
Eremicaster pacificus MADSEN 1951 pp. 76-78, fig. 1. (With list of literature).

Galathea St. 465. Java Trench, 10°20'S., 109°55'E., 6930-7000 m. – 5 juvenile specimens.
Galathea St. 650. Kermadec Trench, 32°20'S., 176° 54'W., 6620 m. – 3 specimens.

The five juvenile specimens from the Java Trench range in size from R. 8 mm with r. 4 mm to R. 14 mm with r. 6 mm; R/r thus varying from 2 to 2.3. The number of superomarginal plates in these specimens is 6 (or 5). None of the superomarginals bear spines. The two adambulacral spines are placed on the aboral half of the plates. The number of adambulacral plates is 10 to 12. The jaws bear, besides the single spine on the tip, from 1 to 3 small spines on either side. The dorsal side may be provided with rather many small spines placed centrally and interradially, but may also be almost completely naked (without the surface showing signs of having been rubbed). The ventrolateral plates are naked. The characters of these specimens thus correspond to the specimens described by LUDWIG in 1907 under the name of *Porcellanaster vicinus* var. *inermis*.

The specimens from the Kermadec Trench measure: R. 25 mm, r. 8 mm; R. ab. 29 mm, r. 10 mm; and R. 30 mm, r. 9 mm; R/r thus about 3. The number of superomarginal plates varies from 9-10 in the smallest specimen to 11 in the other two. Spines are present on all the superomarginals of the arms (apart from the distalmost one in some instances), but not on the two innermost plates in the arm angle. These spines are all broken off now, but appear to have been fairly slender. The ventrolateral plates are naked. The jaws have besides the single spine on the tip two spines on either side placed at about equal intervals. The two adambulacral spines are fair-sized and placed on the aboral half or two thirds of the plates. The dorsal side of the three specimens bear small spines centrally and interradially, either very small slender ones up to about 0.2 mm in length, or slightly more robust ones up to about 0.4 mm in length. The number of adambulacral plates is 18-20.

Remarks:

In my paper of 1951 I gave reasons for considering LUDWIG's *Porcellanaster vicinus* only a synonym of his *P. pacificus*. The specimens taken by the Galathea confirm this view.

Distribution:

Eremicaster pacificus is a cosmopolitan deep-sea species. It has previously been collected in many localities in the Eastern Pacific from the Bering Sea to off Peru, and in the Mid-Atlantic, ab. 10° N., 26°W. The finds of the species in the Kermadec and Java Trenches therefore are not surprising. Its bathymetrical range was previously recorded as from 1550 to 5780 m. Now it is known to occur at least as far down in the deep-sea as about 7000 m. The species is the hitherto deepest found sea-star. The family to which it belongs, the Porcellanasteridae, is also the most exclusively deep-sea group of all sea-stars, none of its members hitherto being known from depths less than about 1000 m.

PTERASTERIDAE

Hymenaster blegvadi n. sp.

Textfig. 3. Pl. 1, figs. 1-3.

Galathea St. 658, Kermadec Trench, 35°51'S., 178° 31'W., 6660-6720 m. – 38 specimens.

Diagnosis:

Species of *Hymenaster* of almost pentagonal shape and with pointed arms. The disk fairly low, with well defined, but not markedly raised paxillar radial areas. Supradorsal membrane fairly tough, fibrous, raised by the paxillar spines in low uniformly spaced protuberances. The spiraculae of the paxillar area small, numerous and scattered. The paxillae in 4 radial rows; each paxilla with a circle of 4-7 spines. The actinolateral spines in the proximal half of the radii almost touching those of the neighbouring radius, and in the distal half of the arms reaching to the margin of the disk. One or two adambulacral spines. Jaw plates broad with 1-2 (3) suboral and 3-4 marginal spines.

Type-locality:

Galathea St. 658, Kermadec Trench, 6660-6720 m.

As type is selected a specimen with R. 44 mm and with 2 adambulacral spines. Figs. 3*a* and 3*c* are of the type-specimen. The type is kept in the Zoological Museum of Copenhagen.

Description:

The size of the 38 specimens varies from R. ab. 15 mm to R. 75 mm. Only a few of the specimens are comparatively well preserved, otherwise the material is very badly damaged. The form appears markedly stellate when the interradial membrane is contracted and the supporting actinolateral spines bent towards the disk; but when the interradial membrane is extended the form becomes almost pentagonal with the pointed arms not produced very much and the sides only slightly concave. R/r is about 1.5. The disk is fairly low, 17 mm high in a specimen with R. 65 mm. The radial paxillar areas are well defined, but not much raised. The radius of the paxillar area of the disk is about 16 mm in a specimen with R. 65 mm, and about 14 mm in a specimen with R. 60 mm. The proximal width of the radial paxillar areas is in the former specimen about 17 mm and varies in the latter specimen from 15 to 18 mm. The supra-dorsal membrane is fairly tough, fibrous and crisscrossed by narrow musclebands connecting the tips of the paxillar spines, which

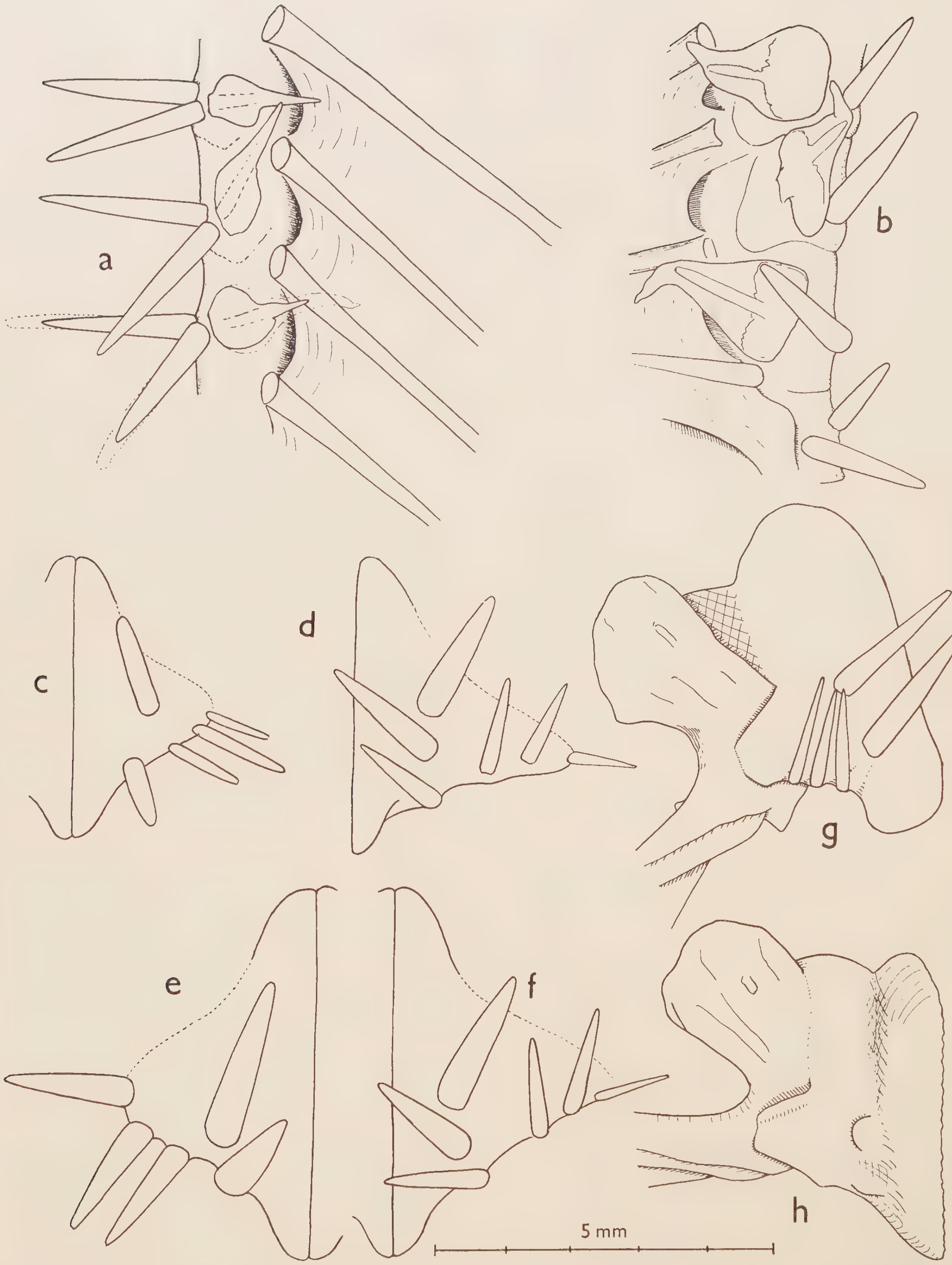

Fig. 3. *Hymenaster blegvadi* n. sp. *a,* fourth to sixth adambulacrals of the type-specimen (R. 44 mm). *b,* first to fourth adambulacrals of a specimen with R. 65 mm. The adambulacral spines are portrayed naked while the aperture-papillae are shown clothed in their sacculi. *c,* mouth-plate of the type-specimen, with the oral margin in the plane of the drawing. *d,* mouth plate of the specimen with R. 65 mm, shown with the edge of the suture in the plane of the drawing; *e-f,* two mouth plates of the same specimen shown with oral margin in the plane of the drawing. fig. *f* shows the same plate as fig. *d. g,* mouth plate of a medium-sized specimen dissected free and shown directly from the side; *h,* the same plate shown with the oral margin in the plane of the drawing.

form fairly low protuberances spaced uniformly over the area. The interradial membrane is provided with spiraculae extending in single or, more often, double rows about half way out between the actinolateral spines and sometimes right to the margin.

There are 4 radial paxillar rows. Each paxilla bears a crown of usually 5 or 6 spines, but varying from 4 to 7. There is no central spine. The length of the paxillar spines varies in one of the larger specimens from 3 to 5 mm. The shaft of the paxillae is short, and their bases are connected by long and slender processes. The oscular valves are large and contain 10 to 15 spines, measuring in the larger specimens up to 8 mm in length. The paxillae forming the valves carry further on their distal side about 4 shorter spines which extend into the supradorsal membrane.

The ambulacra appear petaloid in some specimens but are not at all so in others. The actinolateral spines number about 40-45 in the largest specimens. In the more or less contracted specimens at hand the proximal third to half of these spines almost touch each other, but none of them actually join the neighbouring ones in the midline. Spines nos. 9 to 14 are the largest and measure in the large specimens up to 19 mm.

The adambulacral plates (fig. 3*a-b)* each bears an aperture papilla of which the calcareous part, about 2-$2^1/_2$ mm long, consists of a broad oval, scale-like portion with an acicular tip and is invested in a membrane extending beyond the tip as a slight sacculus. The adambulacral armature consists in addition of usually 2 adambulacral spines in a transverse row, about one fourth longer than the plates and with a sacculus which may be much prolonged. The superficial (ventral) one of these two adambulacral spines is often slightly larger than that deepest in the furrow, which latter may be sabre-shaped. Some specimens are slightly aberrant in having only 1 adambulacral spine. The large specimen with R. 65 mm (fig. 3*b)* thus has 1 adambulacral spine on all the plates apart from the first one, which bears 2 spines, but then there is no aperture papilla, which is otherwise always present on this plate.

The mouth plates are broad and have a broad free margin. Usually there are three slender and fairly small marginal spines rather close together on the distal half or third of the free margin, and besides there may be a somewhat larger marginal spine placed midway between the others and the tip of the jaws. This latter spine may, however, be absent, or moved to the surface of the mouth plate – it may then be regarded as a suboral as well as a marginal spine. In row with this spine there is on the surface of the mouth plate 1 or 2, often fairly stout spines. The marginal spines, however, sometimes are just as large and stout. The combined mouth plates form a high and narrow keel.

All the specimens have had most of their outer skin rubbed off in the trawl, but there are traces of violet skin on the oral surface of some, so that it may be supposed that the specimens were violet when alive.

A few small prosobranchs and calcareous fragments of what was probably a bivalve were found in the stomachs of a few of the specimens.

Remarks:

More than 50 species have been named in this genus of deep-sea sea-stars since WYVILLE THOMSON in 1873 described the first one. Many of the species have been described on much damaged specimens and most of them are recorded from single localities only. I was rather reluctant, therefore, to describe the present specimens as another new species, but I have been unable to identify them with any of the previously described species of *Hymenaster*.

The new species is distinguished by the combination of its characters; and especially the low number of radial rows of paxillae is unusual for the genus.

Freyella mortenseni n. sp.

Textfigs. 4-5. Pl. 1, fig. 4.

Galathea St. 653, Kermadec Trench, 32°09'S. 176° 35'W., 6140-6160 m. – Fragments of arms of one specimen.

Galathea St. 654, Kermadec Trench, 32°10'S., 175° 54'W., 5850 m. – 2 fragmentary specimens and detached arms.

Diagnosis:

Species of *Freyella* with 6 deciduous arms. R. about 30 r, or more ($\geqq$ 180 mm). Disk covered with somewhat irregularly polygonal plates, each with about 5-9 spinelets. Genital region of arms with similar plates, 4-6 across and each with 1-5 spinelets. Actinostomal plates with two marginal spines, one on the outer oral corner and one on the corner adjacent to the first adambulacralia, and with a single, slightly larger, suboral spine with truncate enlarged tip. Adambulacral plates with one aboral

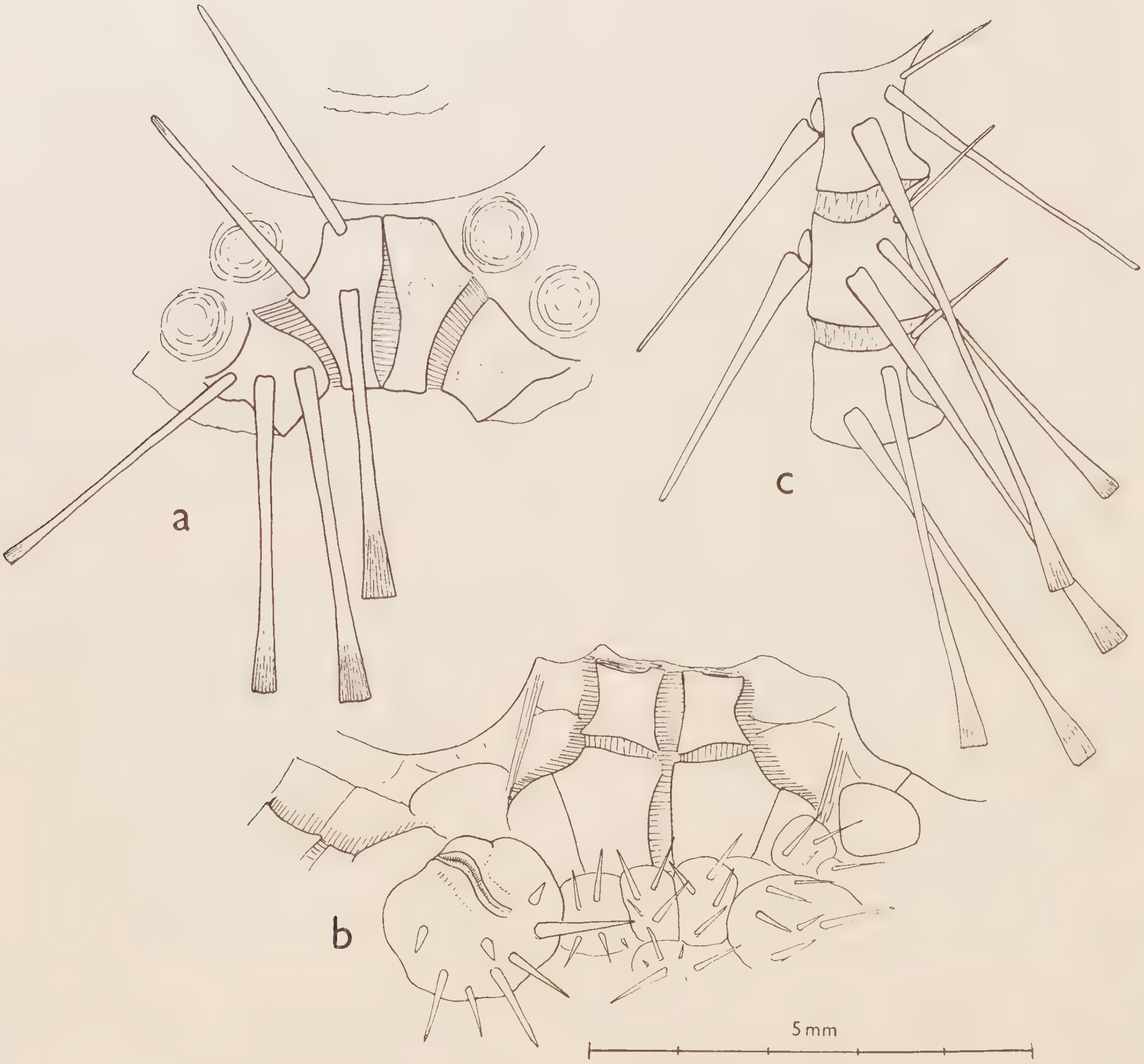

Fig. 4. *Freyella mortenseni* n. sp., type-specimen, *a*, mouth plates and the first adambulacralia, with the spine armature reconstructed on the basis of the spines preserved on different plates. *b*, part of disk from above, showing the madreporite and some of the spinous dorsal plates, besides part of the actinostomal ring and the first pairs of ambulacral plates where these have been laid bare because the covering plates have been rubbed off. *c*, adambulacral plates nos. 5-7 with their spine armature and adjacent marginalia.

furrow spine and, in the proximal part of the arms, 2 subambulacral spines in an oblique row. Distally only one subambulacral spine, and most distally also the furrow spine disappears. A small marginal plate, with a spine similar to the subambulacral ones, present at all adambulacral plates apart from the innermost 4-6. Subambulacral and marginal spines of the innermost plates usually with truncate enlarged ends.

Type-locality:

Galathea St. 654, Kermadec Trench, 5850 m. The type is preserved in the Zoological Museum of Copenhagen.

Description:

The material from St. 653, ab. 6150 m, consisting of detached arms only, would not alone have allowed a definite decision as to its taxonomic position. It is fortunate, therefore, that additional material of the same species was collected at St. 654, including also a specimen which, though fragmentary, was well enough preserved for a sufficient description and thus for deciding that a new species was represented. This specimen, selected as the type, consists of a disk of a diameter of 11 mm with four arms preserved while the two other arms are lost. The arms preserved are in succession; two of them are long ones, measuring up to 110 mm without the missing distal part, while the other two, alternately placed, are small, regenerating. From St. 654 there is, besides some detached arms, also an additional fragmentary specimen consisting of 3 long arms connected by the dorsal skin of their disk and thus representing half an animal. The longest detached arm measures without the missing tip about 180 mm. The genital region of the large arms of the type begins 2-3 mm outside the disk, is 8 mm long and measures where broadest 5 mm. In some of the detached arms the genital region measures 13 mm. The gonads open proximally.

The disk is covered by a number of thin, irregularly polygonal scales, the largest of which are up to about 1.5 mm in diameter. Each plate bears from about 5 to 9 acicular and fairly long spinelets, up to about 1 mm long. Similar scales are found also on the dorsal side of the proximal part of the arms. In the genital area they number 4 to 6 across the arms, are often irregularly hexagonal, and provided with from only 1 to about 5 spinelets, up to 1.5 mm or slightly more in length. Dorsal scales with 1-3 spinelets are found also just outside the genital region, but not far outside they seem to disappear altogether, the arms then being covered with a thin skin with scattered pedicellariae, or with the pedicellariae collected in transverse bands.

The actinostomal plates completely separate the adambulacralia of adjacent arms and are, from oral margin to outer margin, about twice as long as wide. They bear on their oral margin, on the corner at the ambulacral furrow, a slender spine of a lenght of about 3 mm, and a similar one on their furrow margin, at the aboral corner adjacent to the first adambulacralia. The actinostomal plate bears further at the middle of its surface a single suboral spine a little longer than the marginal spines and measuring $3^1/_2$-4 mm, i. e. of about twice the length of the oral plates. This spine has the outer end enlarged and truncate.

The adambulacral plates are proximally in the arms slightly broader than long (about 1.5-2 mm), but increase gradually outwards of the genital region to a length of about 5 mm, or slightly more, by a width of only 1 mm. The adambulacral armature consists in the proximal half of the arms of a furrow spine on the aboral end of the plate and of two subambulacral spines in an oblique row, ranging in the most proximal plates from the furrow spine to the adoral outer corner, but on the longer plates outside the genital region only occupying the distal half of the plates. In the distal half of the arms there is only a single subambulacral spine on the middle of the adambulacral plate or somewhat more aborally; and most distally in the arms also the furrow spine disappears.

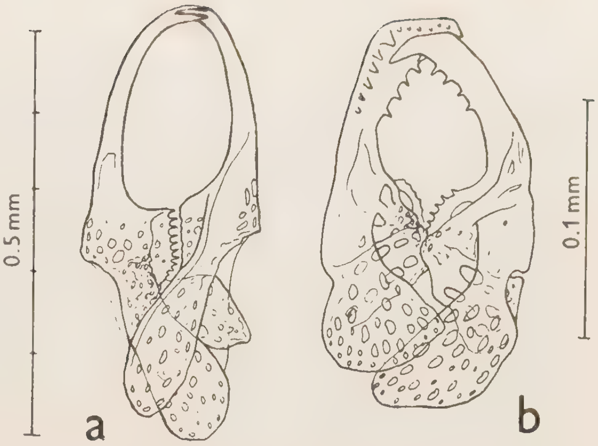

Fig. 5. *Freyella mortenseni* n. sp. Pedicellariae, *a* from the oral area and *b* from an arm.

The subambulacral spines measure up to about 5 mm or, exceptionally, 6 mm in length. Those on the first plates, including those of the genital region, are usually both truncate enlarged at the end, though the inner one may be acicular. Distally in the arms however, they become all very slender and acicular. The furrow spines reach in the proximal part of the arms across the furrow, measuring about 2.5 mm, but outside the genital region they decrease in lenght, becoming mere spinelets before they eventually disappear completely.

A very small marginal plate is present aborally of or close to the middle of all the adambulacral plates except the innermost 4-6. This small plate carries a spine similar to the neighbouring subambulacral ones. A superficial inspection of the arms thus seems to show on each ambulacral plate 3 or, distally, 2 spines, the dorsal of which, however, is the marginal one.

All the spines have been invested in a membraneous sheath carrying numerous pedicellariae; those of the actinostomal plates fairly large and with curved valves (fig. 5*a)* those of the subambulacral spines smaller and with peculiar triangular valves (fig. 5*b)*. Pedicellariae similar to the lastmentioned ones are found also on the dorsal skin of the arms beyond the genital region and seem mostly collected in transverse bands.

Remarks:

Six other species described of *Freyella* have the same small number of arms, viz. 6, as *F. mortenseni,* and like this species they belong to the deep-sea fauna, most of them having a known bathymetrical range down to depths between 4000 and 5000 m. They show the following differences from *F. mortenseni:*

F. mexicana A. H. Clark 1939 differs, among other characters, in having 9-12 spines on the actinostomal plates.

F. tuberculata Sladen, *F. sexradiata* Perrier, and *F. giardi* Koehler all have a single spine only on the plates of the dorsal side of the genital area, and besides they have a different spine armature on the actinostomal plates.

F. benthophila Sladen and *F. oligobrachia* (H. L. Clark) both have a few spinelets on each of the plates of the genital area as has *F. mortenseni*. They differ, however, in having two spines on the oral margin of the actinostomal plates and no spine on the furrow margin adjacent to the first adambulacralia. Incidentally I fail to see how it is possible to keep *F. oligobrachia* specifically distinct from *F. benthophila*.

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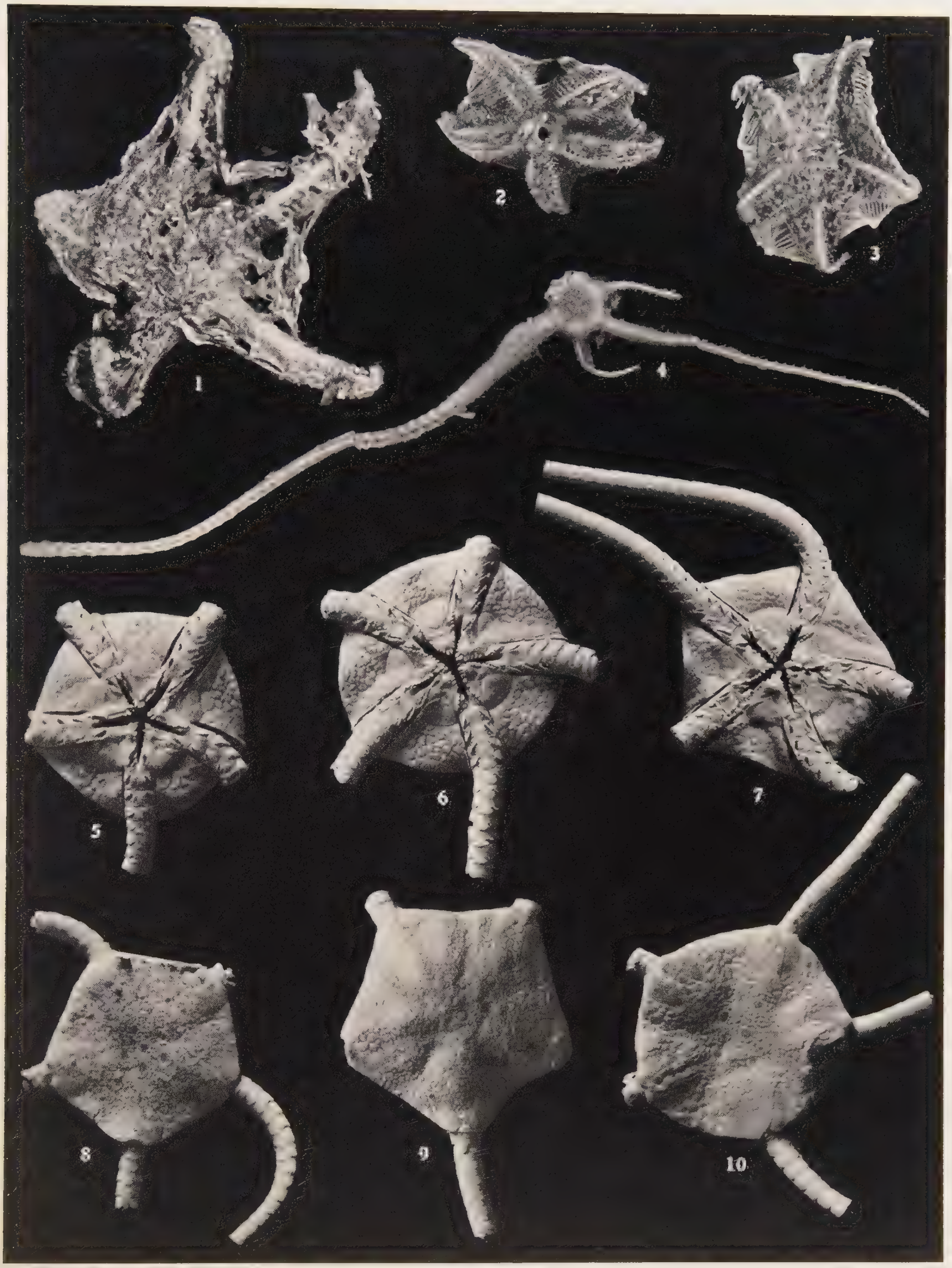

Figs. 1-3. *Hymenaster blegvadi* n. sp. 1, the type-specimen; figs. 2-3, two smaller specimens from the ventral and the dorsal side respectively. Natural size. Fig. 4. *Freyella mortenseni* n. sp., type specimen. Natural size. Figs. 5-10. *Ophiura loveni* (Lyman), Galathea St. 658, six specimens from the ventral and the dorsal sides respectively. 2.3 × natural size.

HOLOTHURIOIDEA

FROM DEPTHS EXCEEDING 6000 METERS

By BENT HANSEN
Zoological Museum, Copenhagen

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INTRODUCTION

The present paper deals with the holothurians collected by the Galathea Expedition at depths exceeding 6000 metres. These depths were reached in five indo-pacific trenches, viz. the Philippine, the Sunda, the Banda, the New Britain, and the Kermadec Trenches.

Previous to the Galathea Expedition only a single species of holothurians was known from depths of more than 6000 metres. This species was taken by the Swedish Albatross Expedition in 1948 in the Puerto Rico Trench at a depth of 7625-7900 m. It belonged to the genus *Peniagone* or *Scotoanassa*, but could not be determined to species (MADSEN 1953).

The investigations of the Galathea Expedition revealed that the holothurians form an extremely dominating animal group on the soft bottom of the deep sea. At depths exceeding 6000 metres their number of species as well as of individuals exceeds that of the four other echinoderm groups together. In these respects very few other animal groups can compare with them. In the amount of weight per square unit of bottom the holothurians are far ahead of any other animal group and probably the same applies to their ecological importance. The prevalence of holothurians was stated without exception for the five deeps investigated.

Of the five holothurian orders four are represented in the material, viz. the Elasipoda with 8, the Aspidochirota with 3, the Molpadonia with 2, and the Apoda with 1 species. The absence of the Dendrochirota is probably not due to chance, but might be explained by their peculiar feeding habits. Whereas the other holothurians take their food from the bottom material, the dendrochirotes live on plankton which they filter off the water by means of their long, dendritic tentacles. Apparently, the water of the deep sea is too poor in nutrient matter to offer satisfactory conditions for the dendrochirotes. Similarly, the preponderance of the holothurians over the other echinoderm groups might also be explained by their feeding habits. The relatively poor food conditions of the deep sea also do not favour the predatory animals. The feeders on bottom detritus seem to be the animals best adjusted to these conditions.

The prevalence of the holothurians in the deepest deep sea is clearly shown by the fact that all the trawlings brought up holothurians.

Also the five stations where we worked with the 0.2 m² Petersen Grab showed the same results. The two most successful ones gave one holothurian each. At st. 424 of the Philippine Trench the grab contained no other animals than a single *Myrio-*

trochus bruuni, while at st. 499 of the Banda Trench several other animals were present. The grab contained at these two stations 26 and 43 litres of bottom material, respectively. The three samples without holothurians contained 20, 16, and 6.5 litres, respectively.

Of the 13 identifiable species the following five are new to science: the elasipods *Scotoplanes galatheae* and *Peniagone vedeli*, the aspidochirote *Paroriza grevei*, the molpadid *Hadalothuria wolffi*, and the synaptid *Myriotrochus bruuni*. The genus *Hadalothuria* is new to science.

One species could only be determined to genus. It is a *Peniagone* from st. 495 of the Banda Trench. About ten fragments, probably belonging to the same individual, were found. The skin contained numerous calcareous bodies. The velum and some of the tentacles were present, but all the tubefeet were lacking, and it was not possible to form any idea of the shape of the animal. The species may possibly be identified if more material could be obtained from the lower depths. In the present paper no identification will be made.

ELASIPODA

Elpidia glacialis Théel 1876

THÉEL 1876, pp. 1-30, pl. 1-3.
– 1882, pp. 18-19.
DANIELSSEN & KORÉN 1882, p. 17-19, fig. 16-30.
PERRIER 1902, pp. 423-24.
MORTENSEN 1932, pp. 41-43; pl. 1, fig. 4-5.
HEDING 1940, pp. 370-71.
– 1942, pp. 16-19, fig. 16-17.

Material:

St. 465, Sunda Trench, 10° 20′ S, 109° 55′ E, 6930-7000 m, 7 specimens. St. 466, Sunda Trench, 10°21′ S, 110°12′ E, 7130-7160 m, bluish clay, c. 3000 specimens. St. 517, New Britain Trench, 6°31′ S, 153°58′ E, 8920 m, 14 specimens. St. 521, New Britain Trench, 5°59′ S, 153°28′ E, 8810-8940 m, clay, 63 specimens. St. 649, Kermadec Trench, 35°16′ S, 178°40′ W, 8210-8300 m, grey clay with pumice, c. 1800 specimens. St. 650, Kermadec Trench, 32°20′ S, 176°54′ W, 6620 m, brown clay with pumice, 1 specimen.

Besides, 14 specimens from st. 602 in the Tasman Sea are included in the present paper. The data of this station are the following: 43°58′ S, 165°24′ E, 4580 m, bluish clay.

Previous records. *Elpidia glacialis* is the first described and the best known of the elasipods. It was taken for the first time by a Swedish expedition in the Kara Sea, where it was common at depths between 70 and 230 m. The 40 specimens taken by this expedition were thoroughly described by THÉEL (1876). Later, especially by the Ingolf and the Godthaab Expeditions, the species was shown to have a general distribution in the deep Norwegian Sea and in the Baffin Bay (HEDING 1942, MORTENSEN 1932).

It is remarkable that whereas *Elpidia glacialis* is the most common deep sea holothurian in this northern area, it has hitherto not been taken by any expedition in the otherwise so well investigated northern part of the Atlantic. On the other hand, it was reported from off Morocco and from a Challenger station between Australia and the Antarctic. These records have met with much doubt, mostly for zoogeographical reasons. The general opinion was that *Elpidia glacialis* was only found north of the Wyville Thompson Ridge, and north of the corresponding submarine ridge in the Davis Strait, separating Baffin Bay from the North Atlantic. The finding of the species in the Indian and Pacific Oceans by the Galathea makes, however, the correctness of these records probable. Off Morocco 8 specimens were taken by the Travailleur and the Talisman at depths of 2300 and 2210 m (PERRIER 1902), and one by the Valdivia at 2480 m (HEDING 1940). The single specimen of the Challenger was taken at 42°42′ S, 134°10′ E, at a depth of 4750 m (THÉEL 1882).

Since *Elpidia glacialis* was held to be one of the type species of the "cold area" north of the Wyville Thompson Ridge, the demonstration of its occurrence as a dominating species in three of the five deeps investigated is of considerable zoogeographical interest. *Elpidia glacialis* should now rather be regarded as a cosmopolitan species, which under extreme conditions, as in the Norwegian Sea with its negative bottom temperatures and in the deep sea trenches, becomes one of the most characteristic holothurians.

The material of *Elpidia glacialis* procured by the Galathea Expedition is furthermore so rich in number of individuals that it allows the demonstration of a geographical variation within the species. On the basis of differences in the number, size, and position of the dorsal papillae, and to a lesser degree in the spicules, the species may be divided into five geographical subspecies.

The northern form is distinguished from all the specimens found by the Galathea by having the dorsal papillae arranged in an anterior and a posterior group. HEDING (1942), who studied the variation in the dorsal papillae of the more than 500 specimens of the Ingolf and Godthaab expeditions from the Norwegian Sea and Baffin Bay, was able to demonstrate an individual as well as a local variation in this character. In the Norwegian Sea the animals usually had 4 pairs of papillae, with 3 and 1 in the anterior and posterior group, respectively. The same was the case with the deepest of the four Godthaab stations in Baffin Bay, whereas the animals from the three remaining Godthaab stations usually had 5 pairs of papillae, 4 in the anterior and 1 in the posterior group. Sometimes extra papillae were present, but even then the arrangement in an anterior and a posterior group was retained. The specimen of the Valdivia, according to HEDING (1940), agrees in the arrangement of the dorsal papillae with the specimens from the Norwegian Sea.

The numerous specimens from the Sunda Trench were nearly all in a very poor state of preservation. Only about 30 were fairly intact. All these had only three pairs of papillae (fig. 1). The first pair is placed at the head just above the tentacle crown. The second pair has a somewhat varying position, from anterior to the second pair of tubefeet to above the third pair. Finally, the third pair of papillae is placed above the interval between the third and fourth pairs of tubefeet. The form from the Sunda Trench is thus easily distinguished from the northern form, firstly by the number of dorsal papillae which in the northern form is never less than four, and, secondly, by their arrangement. In the Sunda form they can not be divided into an anterior and a posterior group.

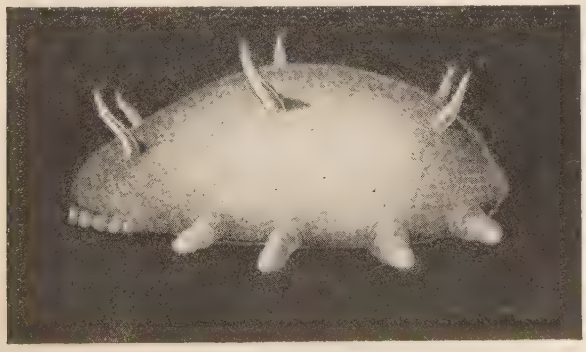

Fig. 1. *Elpidia glacialis sundensis.* (Poul H. Winther del.).

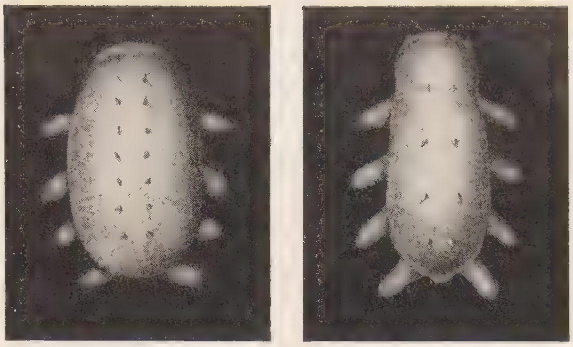

Fig. 2. Left, *Elpidia glacialis solomonensis;* right, *E. g. kermadecensis.* Most of the specimens of *E. g. kermadecensis* have one more pair of papillae than shown on the figure. Both subspecies vary in shape between the extremes here indicated. (Poul H. Winther del.).

It is in this connection remarkable that the specimen from the Challenger station south of Australia had also three pairs of dorsal papillae. THÉEL remarks to this that we are here evidently dealing with a very variable character, and he states that the specimen is otherwise similar to the typical *Elpidia glacialis.* Considering the agreement in the number of papillae between this specimen and the specimens from the Sunda Trench, THÉEL is probably not right in regarding the low number of papillae as an insignificant individual variation. It indicates rather a geographical variation on a larger scale.

The 1800 specimens from st. 649 in the Kermadec Trench (fig. 2, right) are finely preserved. The dorsal papillae are here extremely small, almost devoid of calcareous bodies, and in most cases withdrawn into the skin. Usually, they are only indicated by some white spots on the dorsal side. The single specimen from st. 650 had the papillae somewhat better developed. They were about one millimeter long, and densely provided with transverse calcareous rods. The length of this specimen, which was slightly defect, was c. 30 mm. Although the size of the papillae is thus subject to some variation within the Kermadec Trench, there seems in this character to be a clear difference from the northern form and the Sunda form. In these two forms the dorsal papillae of a 30 mm long specimen measures c. 5 mm. Since the papillae are very stiff because of the calcareous bodies, the small size of the papillae in the specimen from st. 650 is not due to contraction.

The papillae were counted on 100 specimens. Of these 96 had 5 pairs, 3 had 4 pairs, and 1 specimen had 6 pairs. The specimen from st. 650 had 5 pairs of papillae. The papillae are placed all along the dorsal side, usually at quite regular intervals. In some specimens, however, the corresponding left and right papillae are placed more or less obliquely to each other, the intervals between the succeeding papillae thus being unequal. Such irregular arrangements of the papillae are, however, always insignificant deviations from the regular type, and there is never any indication of an arrangement in an anterior and a posterior group.

In the specimens from the New Britain Trench (fig. 2, left) the dorsal papillae are just as reduced as in the specimens from st. 649 of the Kermadec Trench. They are in most of the specimens totally withdrawn into the body. Their arrangement is regular as in the Kermadec specimens, but their number is different. In 24 of the 63 specimens from st. 521 the papillae could be counted. 1 specimen had 6 pairs, 19 had 7 pairs, and 4 had 8 pairs of papillae. Of the 14 specimens from st. 517 the papillae could be counted on 6. 5 specimens had 7 pairs and 1 had 8 pairs.

The 14 specimens from the Tasman Sea have equally reduced and similarly arranged papillae as those from the Kermadec and New Britain Trenches. In their number they occupy an intermediate position between the two forms. The papillae could be counted in 7 of the specimens. There were 3 specimens with 5 pairs, 3 with 6 pairs, and 1 with 7 pairs.

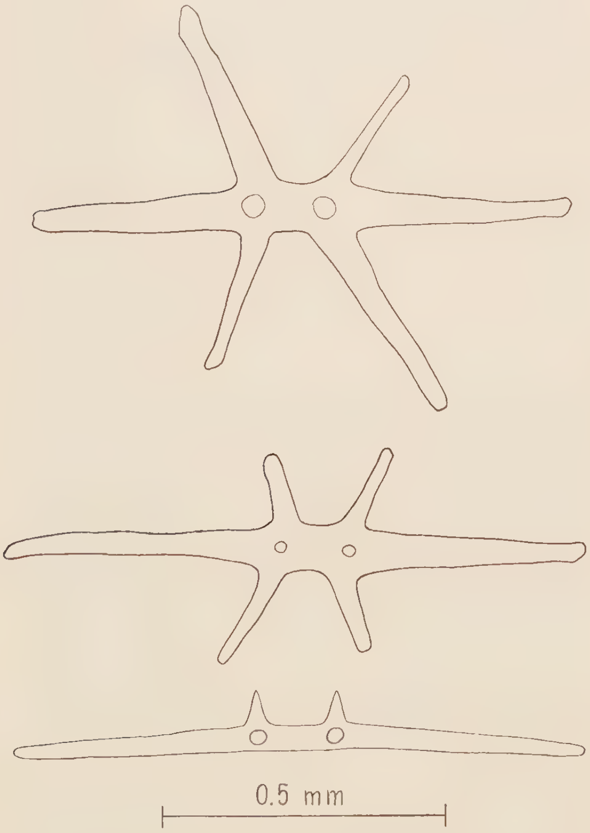

Fig. 3. *Elpidia glacialis kermadecensis.* Spicules; the lower one in lateral view.

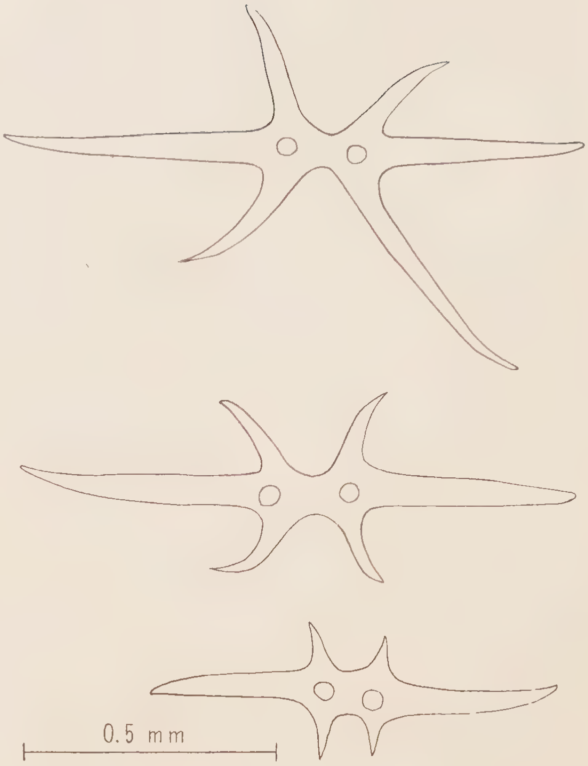

Fig. 4. *Elpidia glacialis solomonensis.* Spicules.

The spicules also show a geographical variation in *Elpidia glacialis.* In the specimens from the Kermadec Trench the spicules have rather slender arms, which are straight and distinctly set off from the main rod (fig. 3). Altogether, 10 specimens from st. 649 and the single one from st. 650 were examined. They were all very similar. On the other hand, there is some variation in the spicules in one and the same animal, some of the spicules being more slender than those figured.

The spicules of the specimens from the New Britain Trench are mostly very characteristic (fig. 4). The arms of the spicules are not so distinctly set off from the main rod, but pass into it by rounded curves. They are more attenuating towards the ends and somewhat curved as against the straight arms in the Kermadec specimens. The smaller spicules are very robust and have short, conical arms. 10 specimens from st. 517 and 5 from st. 521 were examined. As in the Kermadec specimens the spicules of the different specimens are very similar, but subject to some variation within one and the same specimen. Among the typical spicules described there are some which can not be distinguished from those of the Kermadec specimens.

The specimens from the Sunda Trench are equally characteristic (fig. 5). The spicules are here extremely slender, and the arms unusually long. The vertical apophyses, which in the Kermadec and New Britain specimens are rather short, are here more developed. The spicules were examined in 10 specimens from st. 466 and 5 from st. 465. They show the same remarkable similarity as in the specimens from the two other trenches. The variability within the single specimen is neither in these specimens inconsiderable; the more robust spicules can not be distinguished from the more slender ones of the Kermadec specimens.

The specimens from the Tasman Sea are distinguished by having the vertical apophyses of the spicules extremely long (fig. 6). They project far out from the skin and give the animals a quite hairy appearance. The spicules are very slender and smaller than those of the specimens from the three deeps. The small size of the spicules does not seem to be due to the small size of the specimens from the Tasman Sea. Among the specimens from the investigated deeps, the smallest ones have as large spicules as the larger specimens.

For comparison 58 specimens from the northern region were examined. They were selected from the Ingolf stations no. 113, 117, and 120 from the Norwegian Sea (10 specimens from each), and from the Godthaab stations no. 54, 119, and 144 from the Baffin Bay (10, 8, and 10 specimens, respectively).

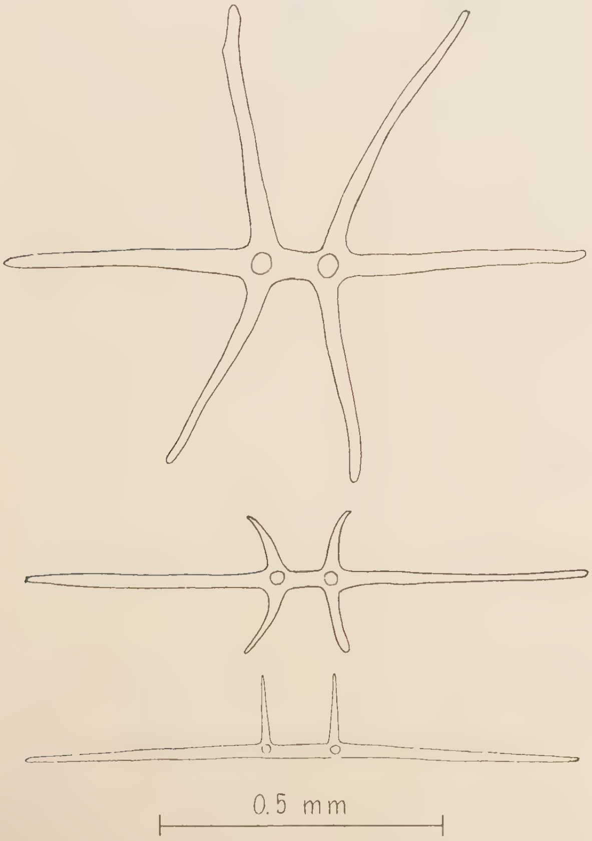

Fig. 5. *Elpidia glacialis sundensis.* Spicules; the lower one in lateral view.

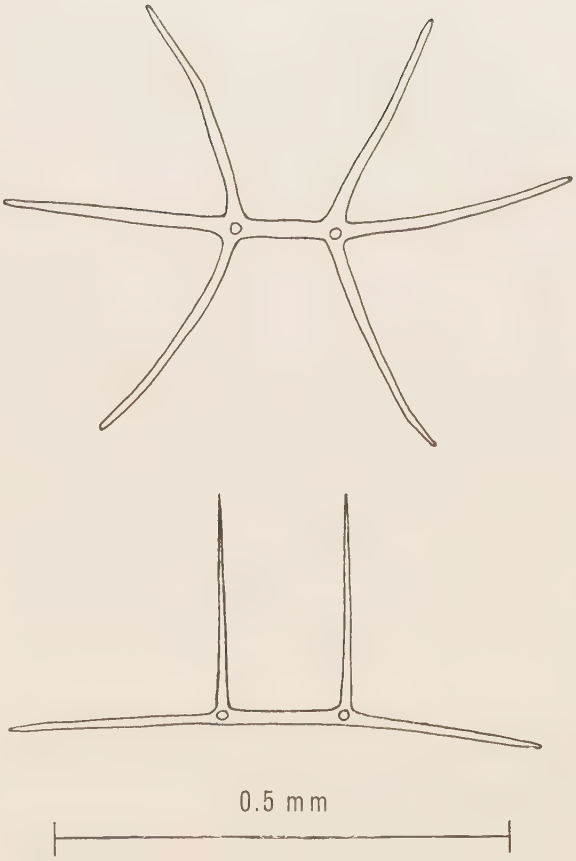

Fig. 6. *Elpidia glacialis théeli.* Spicules; the lower one in lateral view.

The specimens from the 3 Godthaab stations and from the Ingolf station 120 had very slender spicules. In some of the specimens they are similar to those of the Sunda form, both in shape and size. In other specimens they are smaller and differ from those of the Tasman Sea only in their smaller vertical apophyses.

The specimens from the Ingolf station 113 had generally rather robust spicules. Some of the spicules had straight arms and reminded, on the whole, very much of those of the Kermadec form. Others had more curved arms and were more similar to the New Britain specimens. The specimens from station 117 were intermediate between those from the two other Ingolf stations.

The information gained by the examination of the Ingolf specimens is very instructing. The three stations are all situated north east of Iceland, rather near each other, and belong definitely to the same continuous population. In this population we have a range of variation in the spicules, which nearly amounts to that between the specimens from the three deeps. But again, the variation within the same station is considerably smaller than that between specimens from different stations.

Though a geographical variation seems to exist in the spicules, these should, however, be employed with much caution in the intraspecific taxonomy of the species. Even when the spicules in several specimens from one or a few stations are similar, this uniformity need not be of any subspecific value. It may be an insignificant local variation, only. Moreover, the shape of the spicules is a rather ill defined character. It is not easy to select a "typical" spicule among many differing ones.

Among the normal spicules small wheel-shaped ones are sometimes found in the arctic form. They were not found in any of the Galathea specimens, and also not in the Challenger specimen. They are, however, very rare in the arctic form. Among the 58 preparations made from the arctic specimens, only 6 contained a wheel. Wheels occur sporadically in various other elasipods and should be regarded as a juvenile character (EKMAN 1926). No taxonomic importance should be attached to their presence or absence.

A few points of taxonomic interest remain to be mentioned. In the specimens from the Sunda Trench the body is semicircular in cross section as in the arctic specimens. All the pacific specimens are, on the contrary, more or less depressed.

In the specimens from the Tasman Sea the skin is rather soft and dotted with violet spots. In the specimens from the three deeps it is hard, brittle, and light greyish as in the arctic form.

All the specimens have 10 tentacles and 4 pairs of tubefeet.

The calcareous ring does not show any variation of taxonomic value.

The body lengths of the specimens are as follows:

Sunda Trench	20-35 mm
Kermadec Trench	17-30 mm
New Britain Trench	11-27 mm
Tasman Sea	7-12 mm

On the basis of the above differences it might be justified to erect five geographical subspecies of *Elpidia glacialis*. They are distinguished as follows:

A. Dorsal papillae large; body vaulted.
  1. Dorsal papillae divided into an anterior and a posterior group, with 3-4 and 1 pairs, respectively.
    Elpidia glacialis glacialis.
  2. 3 pairs of dorsal papillae, placed on the head, the mid part, and the hind part of the body, respectively.
    Elpidia glacialis sundensis.
B. Dorsal papillae small and regularly distributed; body depressed.
  I. Spicules with very high vertical apophyses.
    3. 5-7 pairs of dorsal papillae; skin soft, with violet spots.
      Elpidia glacialis théeli.
  II. Spicules with low vertical apophyses.
    4. 4-6 pairs of dorsal papillae.
      Elpidia glacialis kermadecensis.
    5. 6-8 pairs of dorsal papillae.
      Elpidia glacialis solomonensis.

Elpidia glacialis glacialis comprises the arctic finds and the finds off Morocco. *E. g. sundensis* is known from the Sunda Trench and from south of Australia. *E. g. théeli, kermadecensis,* and *solomonensis* were found in the Tasman Sea, the Kermadec Trench, and the New Britain Trench, respectively.

Elpidia glacialis kermadecensis and *E. g. solomonensis* are nearly related. The occurrence of the two very differing subspecies *E. g. sundensis* and *E. g. théeli* rather near each other on either side of Tasmania indicates a zoogeographical border south of this island, probably along the submarine ridge running from Tasmania to the Antarctic. Where the border between *E. g. glacialis* and *E. g. sundensis* is to be drawn is not yet to be decided.

The types of the four subspecies taken by the Galathea are preserved in the Zoological Museum of Copenhagen. The typelocalities and the body lengths of the types are as follows: *E. g. kermadecensis,* st. 649, 22 mm. *E. g. solomonensis,* st. 517, 25 mm. *E. g. sundensis,* st. 466, 35 mm. *E. g. théeli,* st. 602, 10 mm.

Periamma naresi (Théel 1882)

Peniagone naresi THÉEL 1882, pp. 47-49; pl. 9, fig. 1-2; pl. 33, fig. 15.

Material:

St. 466, Sunda Trench, 10°21′ S, 110°12′ E, 7130-7160 m, bluish clay, 114 specimens.

Previous records. The species was hitherto known in one specimen only, taken by the Challenger at a depth of 3292 m between Australia and the Antarctic.

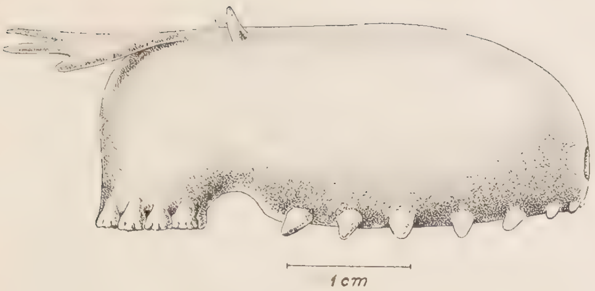

Fig. 7. *Periamma naresi.* (Julie Tesch del.).

The single previously known specimen lacked the hind tip of the body. THÉEL's description is, however, so thorough that the specimens from the Galathea without hesitation may be referred to the same species.

The large material from the Sunda Trench makes a more complete description of the species possible. Besides, it gives a good impression of the individual variation within the species, and particularly of the variation in external appearance due to the different states of preservation.

THÉEL is not able to state the exact number of tubefeet in his incomplete specimen. 6 pairs of tubefeet were present, all fairly well developed. Our specimens have 8-9 pairs of tubefeet. The 6 foremost pairs are more or less well developed, while the remaining 2-3 pairs are quite reduced and placed at the hind tip of the body. In some of the specimens the anterior 6 pairs are equally large and the difference in size between these and the small posterior ones thus very pronounced. In other specimens the 5th and 6th tubefeet are decreasing in size, and the transition to the small ones more gradual. As appears from the above THÉEL's specimen is actually almost complete. It lacks only the hindmost tip of the body with 2-3 pairs of reduced tubefeet. The tubefeet are conical with a small sole, as described by THÉEL.

On the anterior part of the dorsal side is found a velum consisting of two pairs of united papillae, followed by a pair of small, free papillae. Only in a few specimens is it as well developed as on THÉEL's figure. Usually, it measures about one fourth of the length of the animal. A single 4.5 cm long specimen with a 2 cm long velum was, however, found. The length of the free papillae is about 2 mm. The shape of the velum is extremely varying (fig. 8). In the typical case the two middle papillae are largest, but they may also be of the same size or even smaller than the exterior ones. In some specimens the papillae are free in nearly half their length, while in others only their tips are free. In one specimen the velum consisted of four small, almost free papillae. This was very similar to that of *Periamma robustum* (THÉEL 1882, pl. 6, fig. 1-3). In many specimens the velum was quite irregularly formed.

The size and shape of the velum are characters much used in the taxonomy of the species of *Periamma* and *Peniagone.* The variability in this respect in the material of *Periamma naresi* shows that the taxonomic value of this character is very limited. The minute description of the velum, which is often found in the diagnoses of these species, is often more misleading than guiding in the taxonomy. Especially, when a species is described on a single more or less badly preserved specimen, and this is the case with several of them, the description of the velum has not much interest.

Most of the specimens have developed a necklike part between the head and the body. In their external appearance they are very similar to PERRIER's figure of the closely related species *P. roseum* (PERRIER 1902, pl. 13, fig. 10-12). The mouth disc and the flat ventral sole of the body are quite level with each other, but separated by a distinct furrow. On THÉEL's figure there is no neck, the mouth disc shows obliquely forwards, and the ventral side is a little convex. The same appearance is found in the specimens of the Galathea, which are much contracted and filled with mud. It may be pointed out that another species of *Periamma, P. furcata,* was similarly first described without a neck, but later proved to possess one (HÉROUARD 1902 and 1923).

The length of the specimens is 3-6 cm, and their proportions are somewhat varying. The dorsal side is strongly vaulted; the height is one third to one fourth of the length. The diameter of the tentacle crown and the breadth of the ventral sole is a little more than one fourth of the body-length. Some spe-

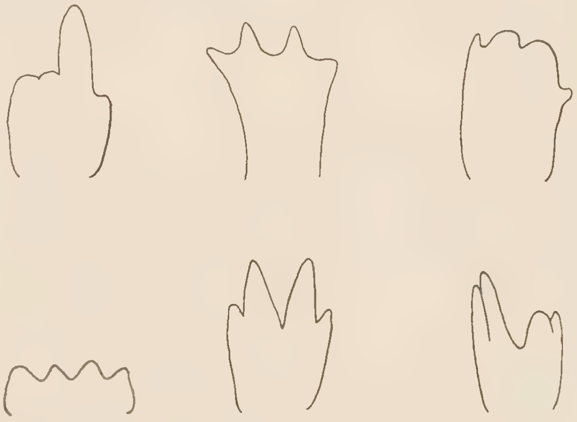

Fig. 8. *Periamma naresi.* Different shapes of the velum.

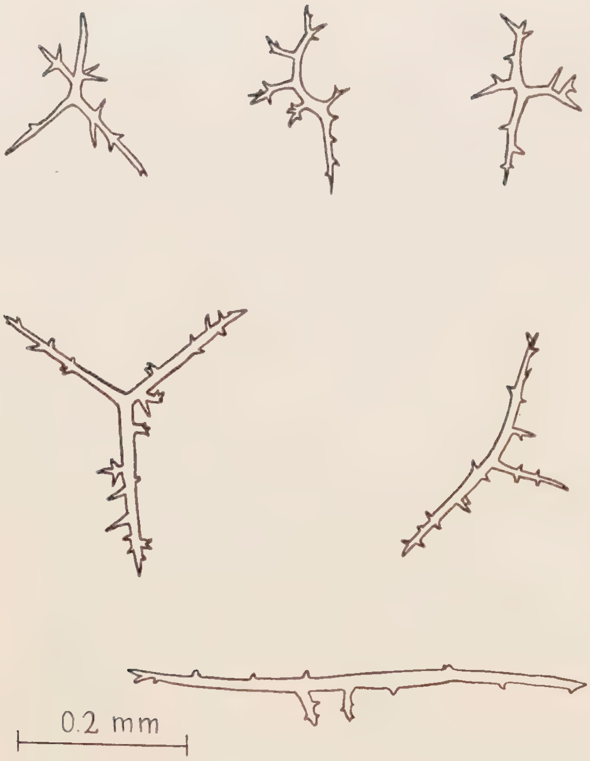

Fig. 9. *Periamma naresi.* Spicules.

cimens were more slender, about five times as long as broad.

The 10 tentacles are all of equal size and provided with a broad end disc with small processes.

The anus is terminal to subdorsal.

The very characteristic spicules refer the specimens with certainty to *P. naresi* (fig. 9). Three types of spicules are found: regular trifid, unbranched to irregularly branched, and C-formed. The regular trifid are distributed in two size-groups, the large with arm-lengths of c. 0,22 mm, and the much more numerous small ones with the arms half as long. Théel states the arm-lengths of the small spicules to be 0,06 mm, but this is apparently a misprint, since the measures on his figure agree with those mentioned above.

Scotoplanes globosa Théel 1879

Scotoplanes globosa Théel 1882, pp. 29-31; pl. 4; pl. 5, fig. 3; pl. 34, fig. 8-9; pl. 44, fig. 12.
Vaney 1908, pp. 409-410; pl. 3, fig. 25-28.
Scotoplanes théeli Ohshima 1915, pp. 242-243.

Material:

St. 650, Kermadec Trench, 32°20′ S, 176°54′ W, 6620 m, brown clay with pumice, 31 specimens. St. 653, Kermadec Trench, 32°09′ S, 176°35′ W, 6140-6160 m, brown clay with pumice, 1 specimen. St. 658, Kermadec Trench, 35°51′ S, 178° 31′ W, 6660-6720 m, brown sand with clay and stones, 17 specimens.

Previous records. *Scotoplanes globosa* was recorded from two Challenger stations and from one station of the Scotch Antarctic Expedition, all from the southern hemisphere, viz. off Chile, south-west of Cape of Good Hope, and the Antarctic Sea south-west of Australia. The depths were 3564-4809 m. *Scotoplanes théeli,* which is here regarded as a synomym of *S. globosa,* was recorded from two Albatross stations at the northern Japan at 545 and 970 m.

Besides, there are in the Zoological Museum of Copenhagen 34 specimens labelled *S. globosa* (det. Heding) from South Africa (no further statement of the locality), and two specimens labelled *S. théeli* (det. Deichmann) from 3762 m off Hawaii (Albatross station no. 2919). Moreover, 7 specimens were taken by the Galathea off the Gold Coast (st. 32, 4°05′N, 2°13′ W, 2047 m).

The specimens agree well with Théel's description, both in regard to the external characters and the spicules. There are three pairs of dorsal papillae, the hindmost quite rudimentary and placed just behind the second pair. The ten tentacles are provided with unbranched processes on the broad end discs. Finally, the spicules quite conform with Théel's figures. They are partly C-formed, partly spinous rods, rarely with branches. In the tentacles there are curved, smooth rods.

Of the 6 pairs of tubefeet the hindmost pair is placed in front of the anus and is more or less rudimentary, in one specimen even absent.

Ohshima's species *Scotoplanes théeli* can in all probability not be upheld. It can not be distinguished from *S. globosa* by means of the spicules, but differs, according to Ohshima, in the shape of the body, the arrangement of the dorsal papillae, and in the absence of an intestinal caecum.

Regarding the first character, Théel's specimens were 1.5 to twice as long as broad, while Ohshima's specimens were more oblong, twice as long as broad, or longer. Considering the changes to which the animals are subject on account of the preservation, no importance should be attached to small a difference. The ratio of length to breadth is variable in the specimens from the Galathea, in some more, in others less than 2 to 1.

In the placing of the dorsal papillae Ohshima mentions two differences between the species. The second pair was in THÉEL's specimens placed about half-way between the middle and the hind tip of the body, but in OHSHIMA's either at the middle or in front of the middle. In our specimens the position of the second pair of papillae is somewhat varying. In most of them they are placed behind the middle, but in some they are seated just at the middle.

OHSHIMA states, as a further difference in the position of the papillae, that the rudimentary third pair in *S. théeli* is not placed directly behind the second pair, but a little more laterally. Though THÉEL does not mention it in his text, his figures show that the third pair of papillae is also here placed somewhat laterally to the second pair. The same applies to the specimens of the Galathea.

The presence of a rectal caecum in *S. globosa* was mentioned by THÉEL, but in OHSHIMA's specimens it was absent. Three specimens from st. 658 were dissected, and none of them had any caecum. On the other hand, two specimens from another Galathea station in the Kermadec Trench, st. 668 (depth 2630 m), both proved to have a rectal caecum. In one only a small vesicle was present, but in the other it formed an enormous mud-filled pouch on the rectum. The said specimens from South Africa in the Museum of Copenhagen show similar conditions. They have the skin so transparent that the intestines are visible through it, and they are therefore well suited for studying the rectum. The rectum is in all the specimens strongly filled with mud and thereby more or less distended. In some cases the distension has the shape of a caecum. There is thus apparently no sharp distinction between a distended rectum and a rectum provided with a caecum. This character should therefore not be used for separating *S. théeli* from *S. globosa*.

Scotoplanes galatheae n. sp.

Material:

St. 435, Philippine Trench, 10°20′ N, 126°41′ E, 9790 m, very stiff clay, 1 specimen.

The type is preserved in the Zoological Museum of Copenhagen.

Diagnosis: *Scotoplanes* with five pairs of well developed lateral tubefeet. Dorsal papillae lacking, or only present on the anterior part of the dorsal side. Tentacle crown very conspicuous and directed straightly forward. Spicules of two types: slightly spinous rods in the tentacles, tubefeet and very rarely in the body-wall, and C-formed ones in the body-wall.

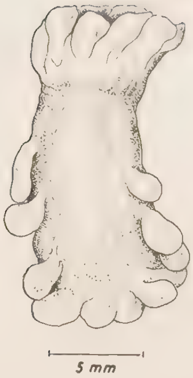

Fig. 10. *Scotoplanes galatheae.*
Ventral view.
(Poul H. Winther del.).

The single specimen taken is 17 mm long, including the tentacles, and 8 mm broad. The body is rather flat, oval, and along the lateral edges provided with 5 pairs of c. 2 mm long, outwardly directed tubefeet, placed at fairly regular intervals.

The mouth is terminal and surrounded by 10 very conspicuous tentacles, directed straightly forward. These are all of the same size, c. 2 mm long and 1 mm broad, the end discs being a little broader and carrying 8-10 small knobs along their edges.

The specimen is complete, except that the skin is slightly torn on the anterior part of the dorsal side. This defect appears at about the place, where some *Scotoplanes*-species possess a velum. Possibly, *S. galatheae* also has a velum at this place.

The skin is soft, and of a greyish colour.

In order to study the spicules preparations were made of a tentacle, a tubefoot, and a piece of the skin of the dorsal and ventral side (fig. 11). The tentacles and tubefeet have rod-shaped, 0.15-0.30 mm long, transverse, sligthly spinous spicules. In the skin these rods seem to be almost absent; only a single one was found in the preparation from the ventral skin, and none at all in that from the dorsal. Instead, C-shaped spicules are found in the skin, most numerous on the ventral side. They are 0.03-0.05 mm long, and are entirely absent in the tentacles and tubefeet.

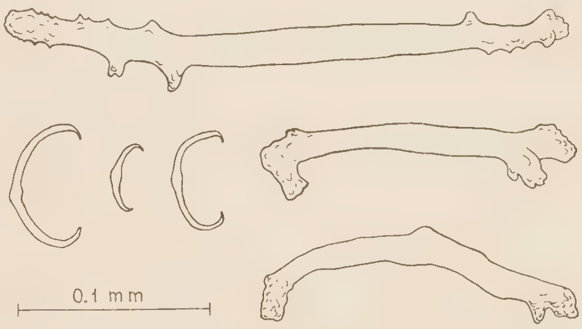

Fig. 11. *Scotoplanes galatheae*, Spicules.

The presence of C-shaped spicules together with rods, and of these two types only, refers the species with certainty to the genus *Scotoplanes* Théel. In the family Elpidiidae only *Periamma* has also C-shaped spicules, but they are here found together with 3-branched ones. These may be reduced to simple rods in the tentacles and tubefeet, but in *S. galatheae* there is nothing to indicate that the rods are derived from branched spicules.

HÉROUARD (1923) erected the genus *Ellipinion* for four species of *Scotoplanes*. The two genera differ only in the arrangement of the dorsal papillae. *Scotoplanes*, as defined by HÉROUARD, has dorsal papillae both anteriorly and posteriorly, while in *Ellipinion* they are only present anteriorly. Their spicules are, however, so similar that species belonging to each of the genera may have indistinguishable spicules. This is e. g. the case with *S. globosa* and *S. (Ellipinion) mollis*. The genus *Ellipinion* is therefore hardly justified.

S. galatheae is clearly distinguished from the hitherto described species of the genus. Only *S. murrayi* Théel has also five pairs of tubefeet, but this species has large dorsal papillae both on the anterior and posterior part of the back. The spicules, which are very unspecific in the species of *Scotoplanes*, are in *S. galatheae* characteristic by their distribution. While the two types of spicules in other species of the genus occur scattered among each other, the rods in *S. galatheae* are almost confined to the tentacles and tubefeet, and the C-shaped spicules found only in the body-wall.

Peniagone vedeli n. sp.

Material:

St. 649, Kermadec Trench, 35°16′ S, 178°40′ W, 8210-8300 m, grey clay with pumice, 160 specimens. St. 650, Kermadec Trench, 32°20′ S, 176° 54′ W, 6620 m, brown clay with pumice, 260 specimens. St. 651, Kermadec Trench, 32°10′ S, 177°14′ W, 6960-7000 m, brown clay with pumice, 6 specimens. St. 653, Kermadec Trench, 32°09′ S, 176°35′ W, 6140-6160 m, 1 specimen. St. 658, Kermadec Trench, 35°51′ S, 178°31′ W, 6660-6720 m, brown sand with clay and stones, c. 600 specimens.

Typelocality: St. 658. The type, 4.2 cm long, is preserved in the Zoological Museum of Copenhagen.

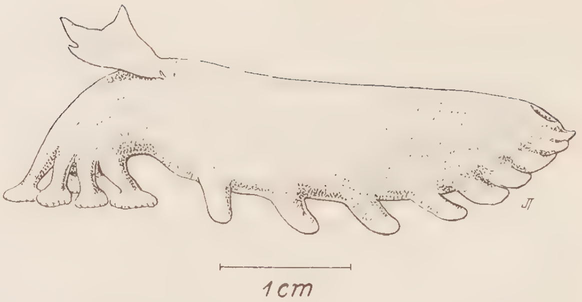

Fig. 12. *Peniagone vedeli.* (Julie Tesch del.).

Diagnosis: *Peniagone* with 9-11 pairs of ventro-lateral tubefeet placed along the whole length of the body. Velum well developed, composed of two pairs of papillae, and followed by 1 or 2 pairs of free, rudimentary papillae. Spicules very varying, mostly with a rather long primary rod and slightly inwardly curved, spiny arms, which are usually twice as long as the primary rod; the vertical apophyses short, very robust, and strongly provided with spines.

The numerous specimens taken were nearly all in a very poor state of preservation. The tubefeet and tentacles are mostly totally lacking, and the velum is only in a few specimens so well preserved as to give an idea of its shape. By a comparison of different specimens it is, however, possible to form a good idea of the outer appearance of the species.

The specimens are from 3 to 9 cm long. The breadth of the body is in most of the specimens about one sixth of the length, but may amount to one fourth.

The mouth is approximately ventral, very small, and surrounded by ten equally developed tentacles. These measure, in a 6 cm long specimen, c. 1 cm; they have a slender stalk and a conspicuous, c. 5 mm broad, end disc provided with numerous small papillae on the surface and irregular incisions round the edge.

The 9-11 ventro-lateral tubefeet are placed along the whole length of the body. The 4-5 foremost are about 5 mm long and placed at distinct intervals, while the following are decreasing in size and placed close to each other. The hindmost 2-3 pairs are sometimes hardly visible. The height of the body decreases towards the posterior end. The flatness of the hindmost part of the body is further emphasized by the closely placed tubefeet, which nearly form a lateral brim.

In the development of the velum there is some variation in the specimens. It may measure about one fourth of the length of the animal, but mostly

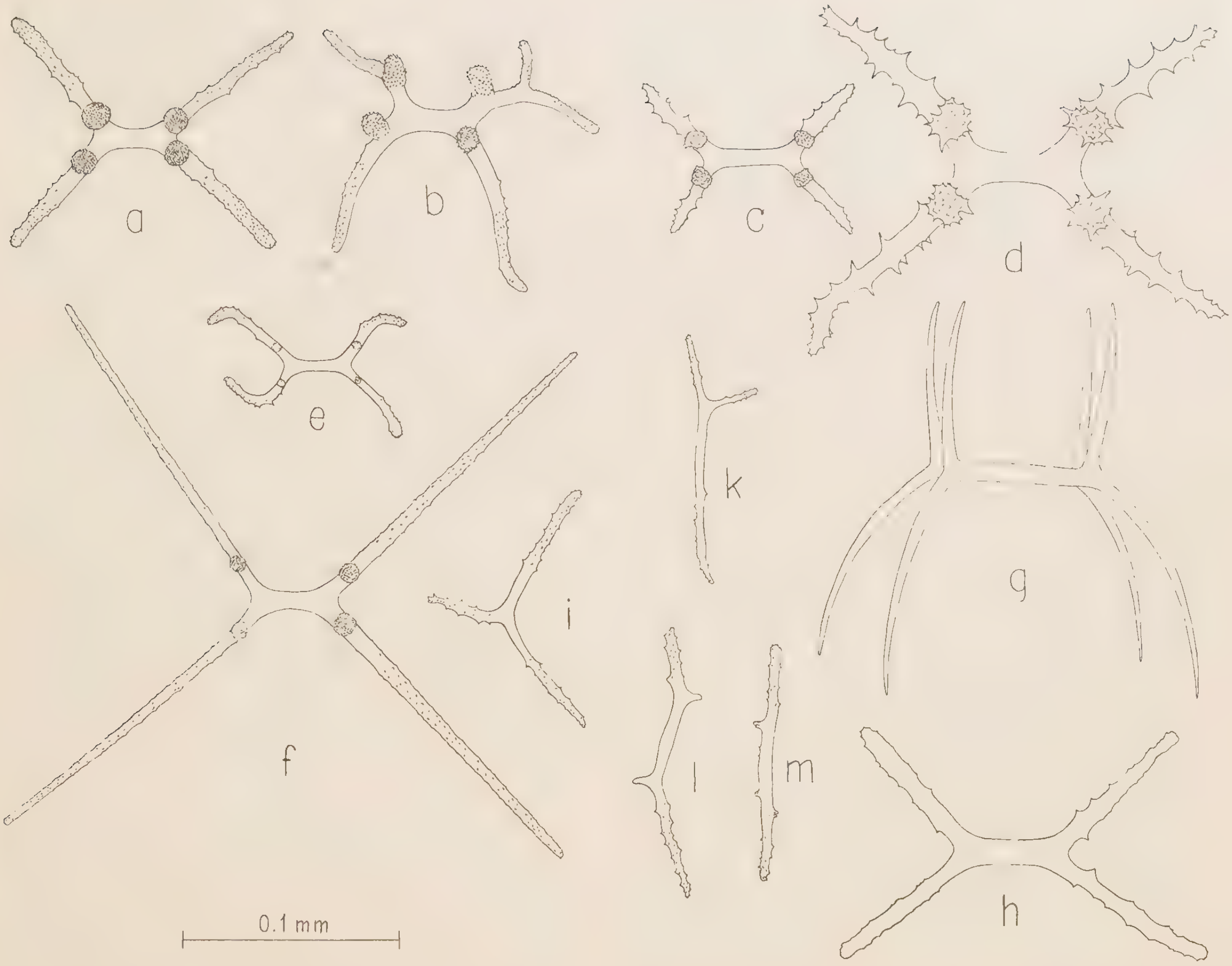

Fig. 13. *Peniagone vedeli.* Spicules; a-g. from the skin; h. from the peritoneal covering of the skin; i-m. from the tentacles.

it is much smaller, apparently contracted, and its shape is then difficult to decide. Fig. 12 shows a specimen with an unusually well developed velum; this is composed of two pairs of papillae, of which the two central ones are the largest. The papillae of the velum may be free in a great part of their length, or may be free in their outmost tips only. Behind the velum one or two pairs of rudimentary, free papillae are found. They are sometimes only indicated by their water vascular canals.

The anus is placed above the hindmost tubefeet.

The skin is soft and mucous, and so transparent that the longitudinal muscles are clearly visible through it. Its outer layer, which is generally worn off, is quite rough due to the densely crowded spicules.

The spicules show a very wide range of variation both in size and shape. By far the most common type is that shown in fig. 13 a-b, with the arms curved slightly inwardly and densely provided with small spines. At the base each arm carries a vertical, rather short, but very robust and spiny apophysis. The arms are sometimes more or less irregularly shaped, e. g. provided with side-branches. Among these spicules some rather differing ones are found, e. g. some with very short arms (c), some very large and robust, with few, but strong spines (d), others with long slender arms (f), and finally, very rarely occurring, quite smooth spicules with strongly curved arms and high, slender apophyses (g).

In the inner, peritoneal covering of the skin the spicules are usually very slender, smooth, and lack the apophyses. Often they are as large and slender as in fig. 13f, but they may be more short-armed and somewhat spiny (h).

Common to all the spicules are their long primary rods. The spicules are never cross-shaped.

In the tentacles and tubefeet, and sometimes in the body-wall, the spicules are reduced to trifid or rod-shaped (i-m). The longitudinal muscles contain slender rods.

The spicules were studied in 60 specimens. The dominant type of spicules is not always the same. In some specimens the most common type was e. g. that shown in fig. 13d. The variation within the same specimen is very great, and all the spicules portrayed in fig. 13 may be found in one animal.

Among the previously described species, *P. vedeli* seems to be most nearly related to *P. azorica* v. Mar. (von Marenzeller 1893, pp. 12-13; pl. 1, fig. 4; pl. 2, fig. 5). The outer appearance is very similar in the two species; the number and distribution of the tubefeet is for instance the same. They differ, however, in the calcareous bodies. I had the opportunity to examine 6 specimens of P. azorica in the Zoological Museum of Copenhagen, viz. 2 taken by the Princesse Alice off the Açores, and 4 taken by the Ingolf south and south-west of Iceland. The spicules of the dorsal skin are all very uniform, with strongly curved arms and high, slender apophyses. They are quite in accordance with von Marenzeller's figure and very similar to that of *P. vedeli* portrayed in fig. 13g. But as said before this type of spicules is quite exceptional in *P. vedeli.* In the ventral skin a very wide range of variation in the spicules was found. The variation is greater than described by von Marenzeller. In one specimen from the Princesse Alice and in one from the Ingolf the ventral spicules could not be distinguished from the dorsal ones. In the four other specimens the ventral spicules were more slender, had shorter apophyses, and less curved arms than the dorsal spicules. But even here a few spicules were found, which were quite similar to the dorsal ones.

As appears from the above, the two species are most clearly distinguished in the development of the dorsal spicules. In *P. azorica* they all belong to a type, which is found only exceptionally in *P. vedeli.*

The species is named after A. H. Vedel, Viceadmiral of the Danish Navy and Member of the Galathea Committee.

Benthodytes sanguinolenta Théel 1882

Théel 1882, pp. 104-05; pl. 23; pl. 40, fig. 4-5; pl. 42, fig. 6.
Ludwig 1894, pp. 53-60; pl. 1, fig. 1-8.
Koehler & Vaney 1905, p. 72.
Clark 1913, p. 233.
– 1920, p. 142.
– 1923, p. 420.
Ohshima 1915, p. 245.
Heding 1940, p. 367.

Material:

St. 495, Banda Trench, 5°26′ S, 130°58′ E, 7290-7250 m, clay, 5 specimens. St. 497, Banda Trench, 5°18′ S, 131°18′ E, 6490-6650 m, soft clay, 3 specimens.

Previous records. The species was previously recorded from numerous stations in the Indian Ocean and the Pacific, at depths of 768-5206 m. The westernmost record was at Cape of Good Hope.

The material from St. 495 consists of one large specimen and four juvenile ones. The large specimen is 21 cm long and 3-4 cm broad, including the 1 cm broad marginal brim. It has been ripped up along the whole of the ventral side, and the alimentary canal is absent. No spicules were found in it, though both the ventral and dorsal skin, the tentacles, the gonads, and a piece of a longitudinal muscle were examined. The colour of the specimen is reddish purple, darker on the ventral side and the head, lighter on the back. Against the light dorsal side the small, dark red papillae are rather conspicuous. The fully outstretched papillae are several mm long and very slender. Mostly they are, however, completely retracted, and only indicated by small spots. In some places they form a somewhat irregular double row along each dorsal radius, but in other places they are more scattered over the dorsal side. The number of tentacles is 18 or 19.

The 4 juvenile specimens from st. 495 are 6-8 cm long and only 0.5 cm broad. The ventro-lateral tubefeet are placed at distinct intervals and do not form a lateral brim. On the head and partly on the hindmost part of the body they are, however, rather well developed and closely placed. Only a few dorsal papillae are left; they seem to have been placed in a single row along each radius. The number of tentacles is somewhat difficult to state. One specimen had 18 tentacles, but two other specimens had apparently only 16 and 17 tentacles, respectively. Calcareous bodies are absent from the skin and the tentacles; in one specimen a longitudinal muscle was examined and found to possess numerous very slender, transverse rods.

The 3 specimens from st. 497 are rather poorly preserved. There is one, 15 cm long, complete specimen, and 2 specimens which lack the hind part of the body; they are 8 and 10 cm long, respectively. The body is nearly cylindrical; the diameter of the body is about 1 cm in the two incomplete specimens, and a little more in the complete one. The specimens are thus intermediate in size between the large and the small specimens from st. 495. The head is surrounded by a well developed brim, but on the main body a brim is hardly discernible. The dorsal papillae are arranged in single or double rows along the radii. There were probably 18 tentacles, but their number can not be stated with certainty. Calcareous rods were found in a tentacle examined.

Théel mentions in his description of the species a transverse row of small ventral papillae just behind the tentacle crown. Ludwig could find this row only in a few of his 25 specimens. Neither were they to be found in the specimens of the Galathea.

Benthodytes sanguinolenta is a species without very distinctive features. Maybe, as H. L. Clark (1920) suggested, more than one species are comprised under the name. On the other hand, specimens of *B. sanguinolenta* may sometimes erroneously have been referred to *B. typica*. The species may therefore occur in the Atlantic also. At any rate, the apparently so clear indo-pacific type of distribution should be met with some doubt.

Euphronides verrucosa Ludwig 1894

Euphronides verrucosa Ludwig 1894, pp. 44-48; pl. 3, fig. 1-6.
Clark 1920, p. 140, pl. 1, fig. 2.
Euphronides bifurcata Koehler & Vaney 1905, pp. 75-76; pl. 8, fig. 1-2; pl. 12, fig. 22.

Material:
St. 495, Banda Trench, 5°26′S, 130°58′E, 7290-7250 m, clay, 3 specimens. St. 497, Banda Trench, 5°18′S, 131°18′E, 6490-6550 m, soft clay, 1 specimen.

Previous records. *Euphronides verrucosa* was previously recorded from 4 Albatross stations in the eastern and central Pacific at 2404-4478 m. *E. bifurcata*, which is here regarded as a synonym of *E. verrucosa*, was taken in a single specimen by the Investigator in the Bay of Bengal at 3278 m.

Ludwig's description of *E. verrucosa* is very thorough, and there is little to add. It is a very characteristic species, distinguished by having the dorsal side dotted by warts, which each contains a single large, cross-shaped spicule with strongly inwardly curved arms and a high central apophysis. Between the warts the body wall contains more unspecific, cross-shaped spicules with slightly curved, spiny arms. Moreover, in the ventral skin trifid and rod-shaped spicules are common. In the tentacles only rod-shaped spicules are found. In all these respects the specimens agree with Ludwig's description, just as their external appearance quite concord with his figure.

The number of tentacles was 16 as in Ludwig's and Clark's specimens.

According to Ludwig the species has 4 pairs of dorsal papillae. Two of Galathea's specimens lack the papillae, and the two others have only one pair, placed at about the middle of the body. They are of the same size as the warts, i. e. about 1 mm, but contrary to these they are very slender and fragile. They may easily be torn off, and no importance should therefore be attached to their absence.

The specimens were 6-7 cm long and had a dark purple colour.

E. bifurcata, which is known from a single poorly preserved specimen, is, as already supposed by H. L. Clark, in all probability identical with *E. verrucosa*. It has similar spicules, but differs from *E. verrucosa* by its bifurcate tail, its broader lateral brim, and by the lack of dorsal papillae. The bifurcate tail has probably no taxonomic value. Ohshima (1915) found, within a single population of *E. depressa* Théel, all transitions between an undivided and a half divided tail. The width of the lateral brim is a rather inexact character, varying with the state of contraction of the lateral tubefeet. Finally, the absence of the dorsal papillae might be only a defect of the specimen.

ASPIDOCHIROTA

Mesothuria murrayi (Théel 1886)

Holothuria murrayi Théel 1886 part., pp. 185-86; pl. 10, fig. 16-18.
Mesothuria murrayi Sluiter 1901, p. 24.
Fisher 1907, pp. 683-85; pl. 71, fig. 1, 1a-h.

Material:
St. 497, Banda Trench, 5°18′ S, 131°18′ E, 6490-6550 m, soft clay, 1 specimen.

Previous records. *Mesothuria murrayi* was taken at Juan Fernandez by the Challenger, at the Hawaiian Islands and Japan by the Albatross, and in Indonesian waters by the Siboga. The specimens of the Challenger were taken at 2516 m, whereas all the other finds were from depths between 254 and 560 m.

The material consists of two fragments, probably belonging to the same specimen. One is a complete skin, the other a tentacle crown. The alimentary canal and the respiratory trees are absent.

The length of the specimen has been about 8 cm.

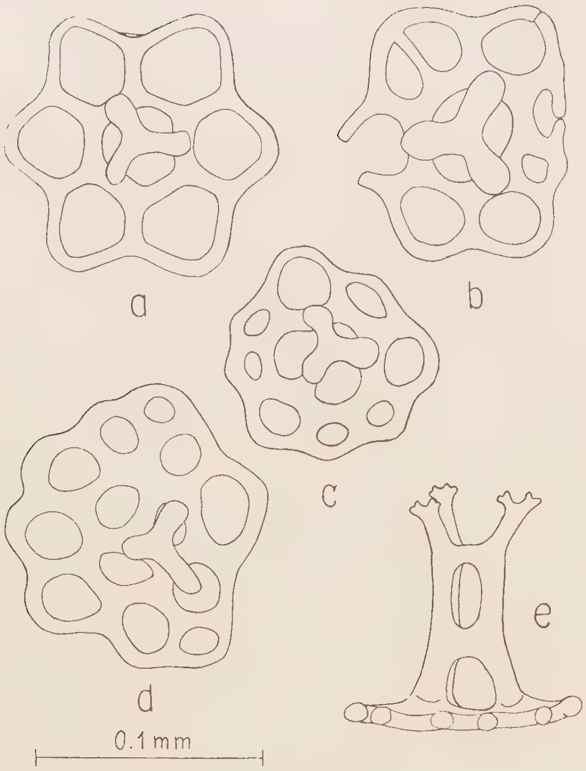

Fig. 14. *Mesothuria murrayi*. Spicules.

The tubefeet are chiefly concentrated near the ventro-lateral ambulacra and form two bands, 5-6 tubefeet broad. The central tubefeet in the band are c. 5 mm long and placed in a more or less distinct double row, while the peripheral ones are smaller and more irregularly scattered. The dorsal side has only few and small tubefeet, and on the ventral side they are completely absent. The colour of the skin is dark brown with a violet tinge. The tentacle crown has 20 peltate tentacles.

The skin contains numerous, imbricating spicules. They are somewhat varying. The most regular and original type is the 6-holed one (fig. 14a). The more or less irregular 8-holed type is, however, much more common (c). This developed from the 6-holed type, as is evident from the transitory stages present (b); the addition of 2 holes is brought about by a secondary division of 2 of the 6 large primary holes. As the number of holes increases, these become smaller, and the spicules more robust. Beside the 8-holed type, such with 7 or 9 holes are common. More rarely there develop, in addition, small peripheral holes (d). Each spicule has a tripartite spire with dichotomously branched points. In the dorsal side the 6-holed spicules are practically absent.

Mesothuria murrayi is nearly related to three species, *M. rugosa* Hérouard, *M. maroccana* Perrier, and *M. parva* Fisher. *M. rugosa* and *maroccana* are atlantic with a depth-range of 1416-3890 m and 909-3120 m, respectively. *M. parva* is a pacific species which has a depth-range of 20-780 m. The taxonomy of these species is rather intricate. *M. murrayi* was recorded also from the Atlantic, but according to Deichmann (1930) these records should be referred to *M. maroccana* and *rugosa,* all the safe records of *M. murrayi* being pacific. The four species are distinguished by the spicules and the distribution of the tubefeet, but both are very varying characters. In our specimen spicules similar to those of both *M. maroccana* and *rugosa* were found. *M. maroccana* has spicules as portrayed in fig. 14a (cp. Perrier 1902, pl. 16, fig. 32-35). The spicules of *M. rugosa* are more irregular as in fig. 14c (cp. Hérouard 1923, pl. 1, fig. 11-21). The taxonomy of these species needs perhaps a revision, but no attempt will be made here on the basis of such small material.

Paroriza grevei n. sp.

Material:

St. 494, Banda Trench, 5°36′ S, 131°01′ E, 7280 m, clay, 1 specimen. St. 495, Banda Trench, 5°26′ S, 130°58′ E, 7290-7250 m, clay, 16 specimens. St. 497, Banda Trench, 5°18′ S, 131°18′ E, 6490-6650 m, 1 specimen.

Typelocality: St. 495. The type, 14 cm long, is preserved in the Zoological Museum of Copenhagen.

Diagnosis: *Paroriza* with the tentacles provided with cup-shaped discs, the edges of which are drawn out in four processes. The body in the larger specimens upwardly curved.

The genus *Paroriza* is nearly related to *Mesothuria.* It is distinguished by having a genital organ on either side of the dorsal mesentery, while *Mesothuria* has only one on the left side, and by the complete absence of calcareous bodies.

The specimens of *Paroriza grevei* were 8 to 20 cm long. The mouth is terminal, the anus subventral. In the larger specimens the body is characteristically upwardly curved. The tubefeet are conical and up to 5 mm long. They usually form a more or less distinct double row along each ventro-lateral radius, but outside this double row they are scattered without any serial arrangement. The papillae are filiform and up to 10 mm long. Along each dorsal radius a double row may be distinguished, but otherwise they are irregularly scattered. The ventral

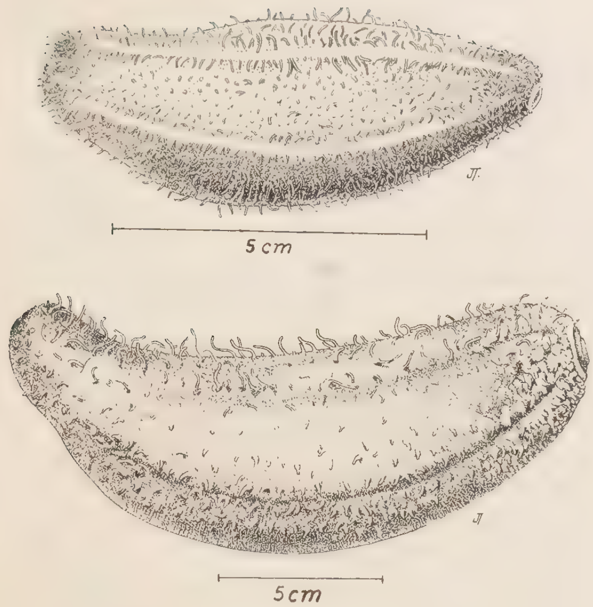

Fig. 15. *Paroriza grevei.* A small and a large specimen in lateral view. (Julie Tesch del.).

radius is naked in the larger specimens, whereas the smallest specimen have the ventral side covered by numerous small tubefeet. Even up to a size of 16 cm there are still some ventral tubefeet present. The small specimens have a greater number of tubefeet and papillae than the large ones, not only in relation to the body-size, but absolutely too. In the large specimens the bases of the tubefeet and papillae in the hindmost part of the body are very enlarged. The skin thereby gets an appearance of being made up of small mosaics, quite as described by HÉROUARD for *Paroriza prouhoi.*

When alive the specimens were brown, somewhat darker on the ventral side.

The tentacles differ from the usual aspidochirote type by the discs being more or less quadrangular, cup-shaped, with the edges drawn out in four processes (fig. 16). They are 20 in number and all of the same size.

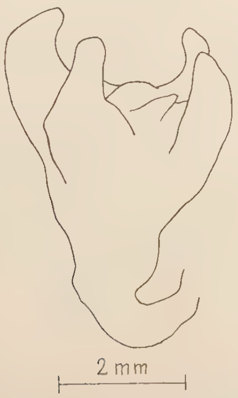

Fig. 16. *Paroriza grevei.* Tentacle.

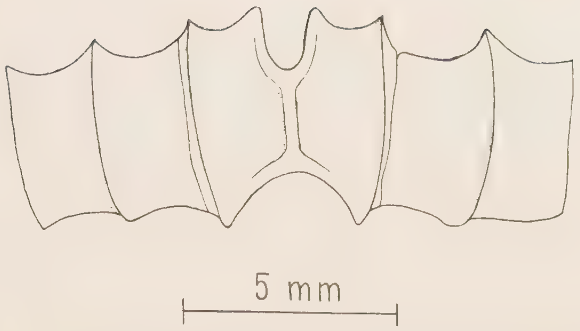

Fig. 17. *Paroriza grevei.* A radial and two interradial pieces of the calcareous ring.

The calcareous ring (fig. 17) is well developed and consists of 10 pieces. The radials carry one median and two lateral ridges. The median ridge bifurcate anteriorly. The posterior edge of the radials is markedly incurved. The interradial pieces are more regular quadratic and have a median, undivided ridge.

Two *Paroriza*-species were previously described, *P. prouhoi* Hérouard and *P. pallens* Koehler. They differ in size and distribution of the tubefeet. In *P. pallens* they are all of the same size and evenly distributed over the whole of the body. *P. prouhoi* has small and large papillae scattered among each other, and the ventral radius is completely naked. In the general appearance the larger specimens of *P. grevei* are somewhat similar to *P. prouhoi,* of which two specimens are known, both 23 cm long. *P. prouhoi,* however, lacks the upward curvature of the body, which is found in the larger specimens of *P. grevei.* Moreover, *P. grevei* is characterized by the peculiar shape of the tentacles.

The species is named after Captain Svend Greve, R. D. N., Commander of the Galathea.

Pseudostichopus villosus Théel 1886

Pseudostichopus villosus THÉEL 1886, pp. 170-71.
HÉROUARD 1902, pp. 11-13; pl. 2, fig. 1-3; pl. 7, fig. 3.
– 1923, p. 23.
DEICHMANN 1930, p. 89.
GRIEG 1921, p. 4.
Pseudostichopus globigerinae HÉROUARD 1923, pp. 23-25; pl. 4, fig. 6.

Material:

St. 651, Kermadec Trench, 32°10′ S, 177°14′ W, 6960-7000 m, brown clay with pumice, 5 specimens. St. 658, Kermadec Trench, 35°51′ S, 178° 31′ W, 6660-6720 m, brown sand with clay and stones, 30 specimens.

Pseudostichopus villosus is a cosmopolitan species, which, apart from 3 specimens taken at 896 m off Guadaloupe (DEICHMANN 1930), is only known from depths between 2615 and 5307 m. The specimens from the Kermadec Deep add nothing to the knowledge of the species, except the greater depth.

MOLPADONIA

Ceraplectana trachyderma H. L. Clark 1908

CLARK 1908, pp. 39-40; pp. 183-84; pl. 13, fig. 5-13.
– 1920, pp. 130-31.

Material:
St. 497, Banda Trench, 5°18′S, 131°18′E, 6490-6650 m, soft clay, 5 specimens. St. 499, Banda Trench, 5° 21′S, 131°17′E, 6580 m, greenish clay, 1 specimen.

Previous records. The species was previously taken in 3 specimens at the Aleutians, and in 2 specimens off Peru, all by the Albatross. The depths were 3188 and 5173 m, respectively.

This peculiar species is unique among the holothurians by having the tentacles modified into horny claws. The specimens agree with CLARK's description both in the shape of the calcareous ring, the long tentacle ampullae, and the spicules. These were examined in 2 specimens (fig. 18). One contained numerous phosphatic bodies, as described by CLARK, the other only traces of them.

The specimens were 1.8-4.5 cm long.

The claw-shaped tentacles suggest that the species is predatory. The content of the alimentary canal was therefore examined in one of the specimens, but it was unidentifiable.

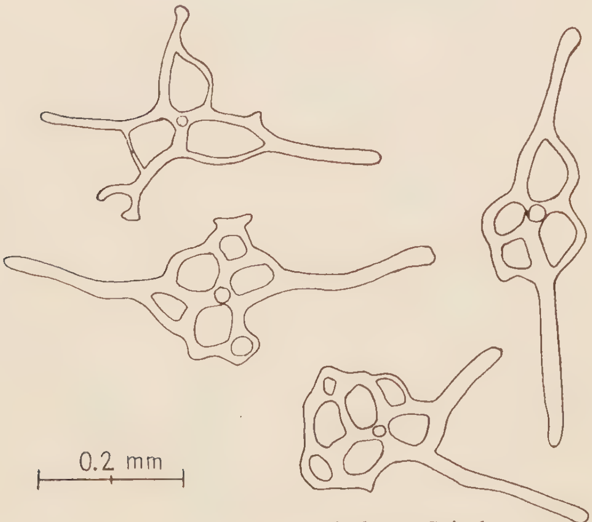

Fig. 18. *Ceraplectana trachyderma.* Spicules.

Hadalothuria wolffi n. g., n. sp.

Material:
St. 517, New Britain Trench, 6°31′ S, 153°58′ E, 8920 m, 1 specimen. St. 521, New Britain Trench, 5°59′S, 153°28′E, 8810-8940 m, clay, 13 specimens.

Typelocality: St. 521. The type, 2.7 cm long, is preserved in the Zoological Museum of Copenhagen.

Diagnosis of the genus: Gephyrothuridae without whiplash-like papillae, but with numerous, rudimentary papillae all along the dorsal and ventro-lateral ambulacra. Mouth subventral.

The peculiar family Gephyrothuridae was erected by KOEHLER and VANEY 1905 for the species *Gephyrothuria alcocki,* which was taken by the Investigator in the Bay of Bengal. Later another species, *G. glauca* (H. L. Clark), was taken in the western Atlantic (H. L. CLARK 1908). This species was originally referred to a separate genus, *Himastlephora* H. L. Clark, because it was thought, contrary to *G. alcocki,* to possess a tail. HÉROUARD (1923), however, showed that a tail is actually absent also in *Himastlephora,* which is therefore to be regarded as a synonym of *Gephyrothuria.* So far, these are the only known species of Gephyrothuridae.

The family, among other things, is characterized by the absence of a tail, the 15 tentacles without ampullae, the shape of the calcareous ring, the simple water-lungs, and the total absence of calcareous and phosphatic bodies.

All these characters are also found in *Hadalothuria wolffi.* It differs, however, from the two *Gephyrothuria*-species in two characters, which seem to be so essential that they justify the erection of a new genus. Though both genera show a development of the ambulacral appendages, which is quite unusual in the Molpadonia, these appendages are very differently developed in the two genera. *G. alcocki* and *glauca* have 4-6 pairs of long, whiplash-like papillae in the dorsal ambulacra. In *G. alcocki* no other papillae are found, while *G. glauca* possess some rudimentary ambulacral papillae both anteriorly and posteriorly. *Hadalothuria* lack the whiplash-like papillae, but has 25-30 rudimentary papillae all along the dorsal and ventro-lateral ambulacra. The second character distinguishing the genera is formed by the position of the mouth. In *Gephyrothuria* the mouth is terminal, in *Hadalothuria* subventral.

The specimens measure from 20 to 35 mm. The skin is brownish and a thin layer of mud adheres to

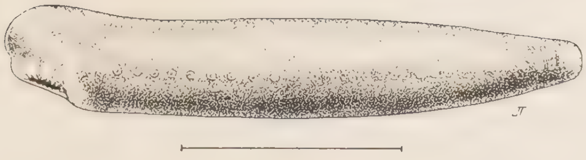

Fig. 19. *Hadalothuria wolffi.* (Julie Tesch del.).

it. The anterior end of the body is dominated by the strongly developed calcareous ring. The width of the body decreases more or less regularly from the head to the anal opening. In a few of the specimens the posterior third or so of the body is rather abruptly set off from the rest, but this is apparently due to contraction, and a tail is never present. The anal opening is terminal.

Along the dorsal and ventro-lateral ambulacra a single row of papillae is found. Each row continues from the head to the anal opening and comprises about 25-30 papillae. They are extremely rudimentary and usually only seen as small white spots when the adhering layer of mud is removed. They are most distinct in the hindmost part of the body; in the anterior part they are only visible in a few of the specimens. The ventro-lateral papillae are better developed than the dorsal ones. The ventral ambulacrum is devoid of papillae.

The calcareous ring is not as usual in the Molpadonia placed vertical to the longitudinal axis of the animal, but has an oblique or even horisontal position. The mouth is consequently placed more or less ventrally. It is partly covered from behind by a fold of the ventral skin. The 15 tentacles (fig. 20) bear a pair of well developed end-digits, and mostly also a pair of rudimentary, proximal papillae. Tentacle ampullae are absent. There is one ventrally placed polian vesicle.

There are 10 firmly united pieces in the calcareous ring (fig. 21). The anterior edge of the ring is provided with 15 pointed processes, the radial pieces carrying 2, the interradial pieces 1 each. The size of the processes and the intervals between them are the same all the ring round, giving the ring a quite regular appearance. The posterior edges of both the radials and the interradials are slightly incurved.

The genital organ consists of a long canal bearing in its posterior part a series of undivided ampullae on each side of the dorsal mesentery. The canal follows the dorsal mid-line and opens anterior to the calcareous ring. The length of the canal is about one fourth of the body-length. No genital papillae are present.

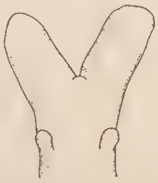

Fig. 20. *Hadalothuria wolffi.* Tentacle.

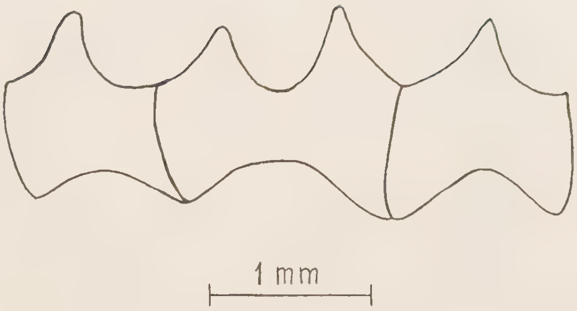

Fig. 21. *Hadalothuria wolffi.* A radial and two interradial pieces of the calcareous ring.

The water lungs form a pair of slender, undivided tubes. They measure about one third of the body length.

The longitudinal muscles are undivided.

Calcareous and phosphatic bodies are completely absent.

The species is named after Torben Wolff, M. Sc., First Zoologist of the Galathea Expedition.

APODA

Myriotrochus bruuni n. sp.

Material:

St. 418, Philippine Trench, 10°13′ N, 126°43′ E, 10190 m, clay with gravel and stones, 96 specimens. St. 419, Philippine Trench, 10°19′ N, 126° 39′ E, 10160-10210 m, clay, 4 specimens. St. 424, Philippine Trench, 10°28′ N, 126°39′ E, 10120 m, brownish clay covering blackish green sand, 1 specimen. St. 517, New Britain Trench, 6°31′ S, 153°58′ E, 8920, 3 specimens.

Typelocality: St. 517. The type, 12 mm long, is preserved in the Zoological Museum of Copenhagen.

Diagnosis: *Myriotrochus* with 10 tentacles and 10 pieces in the calcareous ring. Spicules exclusively wheels, which are scattered all over the body-wall. Number of spokes and teeth in the wheels 12-18 and 25-32, respectively. The spokes without winglike distensions.

The 9 hitherto known species of *Myriotrochus* may be divided into two groups, one with 12, the other with 10 tentacles. *M. bruuni* belongs to the latter,

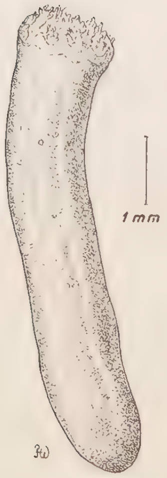

Fig. 22. *Myriotrochus bruuni.* A specimen from the Philippine Trench (Poul H. Winther del.).

together with only two other species, *M. théeli* Østergren (Østergren 1905a) and *M. minutus* Østergren (Østergren 1905b).

The specimens from the Philippine Trench are all 7-8 mm long. The specimens from the New Britain Trench are larger, but only one, the type specimen, is complete. This is 12 mm long. The two other specimens lack the posterior end, but since their calcareous rings are of the same size as in the complete specimen, their body-lengths were probably also about 12 mm.

The calcareous ring (fig. 23) consists of 10 pieces, each with an anterior crest and a slightly inwardly curved posterior margin. The crests are a little higher on the radials than on the interradials, but apart from this all the pieces of the ring are similar. The diameter of the ring is 1.9 mm in the small specimens, and 2.9 in the large ones.

There is a single, large polian vesicle.

The spicules are exclusively developed as wheels (fig. 24), which are evenly scattered over the whole of the body-wall. They are placed rather densely together, but do not overlap. Their number is difficult to state, since they are easily rubbed off. The small specimens usually have about 50 wheels; the large, complete specimen from the New Britain Trench has about 250. The wheels measure 0.09-0.10 mm in diameter, both in the small and the large specimens. The rim of the wheel is provided with 25-32 centripetally directed teeth. The number of spokes is 12-18.

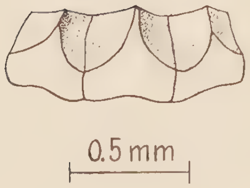

Fig. 23

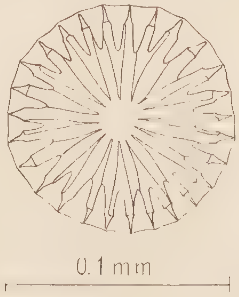

Fig. 24

Fig. 23. *Myriotrochus bruuni.* A radial and two interradial pieces of the calcareous ring from a specimen from the Philippine Trench.

Fig. 24. *Myriotrochus bruuni.* Spicule.

The tentacles are rather robust and bear 4-8 digits on either side. Their shape is very varying with the state of contraction. The fully outstreched tentacle has no end-digit, but on the less outstretched ones the digits form a continuous row from one side to the other.

Myriotrochus bruuni is clearly distinguished from the most nearly related species. *M. théeli* has wing-like, lateral distensions on the spokes, while these are quite circular in cross-section in *M. bruuni.* Moreover, the wheels in *M. théeli* are much more numerous and placed in layers. The number of spokes and teeth in the wheels can not be used to distinguish the species. They are in *M. théeli* 12-15 and 24-30, respectively.

M. minutus is distinguished from all other species of the genus by having calcareous rods in the tentacles. Besides, the wheels are divided into two size-groups and have rudiments of wing-like distensions on the spokes. The number of spokes and teeth is 13-16 and 18-26, respectively.

The species is named after Dr. Anton Fr. Bruun, Scientific Leader of the Galathea Expedition.

GENERAL REMARKS

The material of holothurians collected by the Galathea in the deep sea trenches is of considerable ecological-zoogeographical interest. But also from a purely taxonomical point of view some general conclusions may be drawn from the material.

Taxonomical remarks. The great number of specimens in some of the species gives valuable information concerning the variability of some characters much used in holothurian taxonomy. This was already mentioned under the respective species. Here should again be stressed the variability of the dorsal veil and of the calcareous bodies. The different forms of the veil of *Periamma naresi* (fig. 8) prove that this character should be used with great care in the taxonomy of the holothurians. Similarly, the study of the spicules in numerous specimens of

Peniagone vedeli and *Elpidia glacialis* revealed a great variability in this character also, in *E. glacialis* with a tendency to geographical differentiation. Generally, a greater amount of intraspecific variation should be allowed to the calcareous bodies, than has often been the case. Not a few species of holothurians were undoubtedly separated on the basis of too small differences in their spicules.

Zoogeographical remarks. The zoogeography of the deep sea is subject to fairly divergent opinions. EKMAN (1953) suggests that a cosmopolitan distribution is the exception even for the extremely abyssal species and proposes the division of the deep sea into an atlantic and an indo-pacific region. MADSEN (1951a, 1951b), on the contrary, finds that the distribution of the deep sea Asteroidea and Ophiuroidea rather suggests the division into an atlanto-indian and a pacific region. The Holothurioidea, according to MADSEN (1953), does not clearly support either of these opinions.

The few species dealt with in this paper do not add much to the discussion. Nevertheless, it might be justified to undertake a critical review of these species in regard to their taxonomy and zoogeography.

A thorough taxonomical knowledge of an animal group is a necessary basis of any zoogeographical conclusion. Of the deep sea holothurians a third of the species is known in one specimen only, and few are known in so many specimens and localities that their taxonomical relations are definitely settled. Many endemisms have falsely been indicated by too few finds. A better knowledge of the deep sea holothurians may reveal many synomyms among them and prove that many of them have a cosmopolitan distribution.

The species from the deep sea trenches seem already to point in this direction. Leaving out of account the new species, their distributions are as follows:

Elpidia glacialis. Cosmopolitan, with preponderance in the North Polar Basin and some of the deep sea trenches.

Periamma naresi. Outside the Sunda Trench known only in one specimen south of Australia.

Scotoplanes globosa. Cosmopolitan. Known from the Pacific, the Antarctic Sea south of the Indian Ocean, from south-west of Cape of Good Hope, and from off the Gold Coast.

Benthodytes sanguinolenta. Known from several stations in the Pacific and Indian Ocean. The specific delimitation of the species is not quite clear, and some specimens from the Atlantic previously recorded as *B. typica* might belong to *B. sanguinolenta*.

Euphronides verrucosa. Known from four stations in the eastern and central Pacific, from the Banda Trench, and from the Bay of Bengal. This species is well-defined and may for the present be regarded as the safest indo-pacific species among those dealt with in this paper.

Mesothuria murrayi. According to DEICHMANN (1930) a pacific species. It is, however, not very clearly distinguished from the atlantic species *M. maroccana* and *M. rugosa*.

Pseudostichopus villosus. Cosmopolitan.

Ceraplectana trachyderma. Outside the Banda Trench recorded from only 2 stations in the Pacific.

As will be seen from the list most of the species are not very suited for drawing zoogeographical conclusions. *Benthodytes sanguinolenta* and *Mesothuria murrayi* are too insufficiently known in regard to their taxonomy, and *Ceraplectana trachyderma* and *Periamma naresi* are known from too few localities, to allow any safe conclusion as to their distributions. Of the remaining 4 species, *Euphronides verrucosa* seems to be indo-pacific, while *Elpidia glacialis, Scotoplanes globosa,* and *Pseudostichopus villosus* seem to be cosmopolitan, the two latter with the exception of the arctic basin.

Vertical distribution. Whether the deep sea trenches in their faunas possess endemic elements, is a question of considerable interest, both from an ecological and a zoogeographical point of view. It is, however, very difficult to answer on the basis of the scarce knowledge which we have as yet of the deep sea fauna. We can not safely conclude that the new species taken by the Galathea in the trenches are restricted to these. A better knowledge of the general abyssal fauna might prove that they are found at lower depths also.

Of the 8 species which were previously taken outside the trenches, 5 were known from depths less than 1000 m, thus showing a strikingly wide vertical distribution. *Elpidia glacialis* was found in shallow water only in the Arctic. Similarly, the finds of *Scotoplanes globosa* at 545 and 970 m were from high latitudes, off the northern Japan at temperatures of 1°,6-2°,2 C. These two species may be regarded as examples of the wellknown equatorial submergence

The holothurians taken by the Galathea Expedition at depths exceeding 6000 m

Species	Philippine Trench				Sunda Treneh		Banda Trench				New Britain Trench		Kermadec Trench				
	St. 418 10190 m	St. 419 10160–10210 m	St. 424 10120 m	St. 435 9790 m	St. 465 6930–7000 m	St. 466 7130–7160 m	St. 494 7280 m	St. 495 7250–7290 m	St. 497 6490-6650 m	St. 499 6580 m	St. 517 8920 m	St. 521 8810–8940 m	St. 649 8210–8300 m	St. 650 6620 m	St. 651 6960–7000 m	St. 653 6140–6160 m	St. 658 6660-6720 m
Elpidia glacialis	–	–	–	–	7	c. 3000					14	63	c. 1800	1		–	–
Periamma naresi	–	–	–			114											–
Scotoplanes globosa	–	–	–	–	–	–								31		1	17
Scotoplanes galatheae	–	–	–	1													–
Peniagone vedeli	–	–	–	–	–	–							160	260	6	1	c. 600
Benthodytes sanguinolenta	–	–	–	–			–	5	3		–						
Euphronides verrucosa	–	–	–	–	–	–		3	1			–	–	–		–	
Mesothuria murrayi	–	–	–	–	–	–			1					–	–		
Paroriza grevei	–	–	–	–	–		1	16	1							–	–
Pseudostichopus villosus	–	–	–	–			–	–		–		–		–	5		30
Ceraplectana trachyderma	–		–	–					5	1					–	–	–
Hadalothuria wolffi	–	–	–	–	–	–	–	–	–	–	1	13					–
Myriotrochus bruuni	96	4	1	–	–	–	–		–	–	3	–	–	–	–	–	–

of cold-water animals. On the other hand, *Benthodytes sanguinolenta, Pseudostichopus villosus,* and *Mesothuria murrayi* were taken at depths less than 1000 m in the tropical seas.

The remaining 3 previously known species were only recorded from the abyssal part of the ocean. *Periamma naresi* was taken at 3292 m, *Euphronides verrucosa* at 2404-4478 m, and *Ceraplectana trachyderma* at 3188 and 5173 m.

The number of new species in the material is remarkably high, even if we take into account the limited knowledge we have of the deep sea fauna. Moreover, it is remarkable that the new species especially were found at the greatest depths. The two species from the Philippine Trench were both new to science, and one of them, *Myriotrochus bruuni,* was furthermore refound in the New Britain Trench, here living together with another new species. The relatively many new species together with the preponderance of these at the greatest depths, seems to indicate a certain endemism in the trenches.

On the other hand, the distribution of *Elpidia glacialis* is very instructive. This species, which is a dominating one in the Sunda, Kermadec, and New Britain Trenches, was so rarely found outside the arctic basin that the records were doubted. It has now proved to be a cosmopolitan species, which under the extreme conditions in the deeps, as well as in the arctic basin, develops as a type species.

Something similar is possibly the case with some of the new species from the deeps: They may be widely distributed and only be especially abundant in the deeps. The faunas of the trenches might then be endemic to a less degree, and should rather be regarded as an extract of the general abyssal fauna. Only few abyssal species are able to penetrate into the trenches, but the few which do, as a consequence attain a great abundance in individuals.

As appears from the table, most of the species were taken at more than one station. *Elpidia glacialis* and *Myriotrochus bruuni* were even common to different deeps. The refind of the same species in different localities indicates that the species taken by the Galathea form an essential fraction of the total number of species in the deeps. Similarly, the richness in number of specimens of several of the species indicates a low total number of species; the number of specimens and the number of species may be supposed to be inversely correlated.

If it holds good that only a part of the abyssal fauna is able to subsist in the trenches, these might in consequence in the course of time develop endemic elements. A species, which becomes extinct in the general abyssal fauna, may survive in the deeps on account of the absence of competitors. Later, the species isolated in this way might evolve adaptations to the life at the great depths, so that not only competitional conditions, but also special adaptions to the life in the trenches will prevent them from leaving these.

An isolation of a species in different deeps may be supposed to be followed by a geographical subspeciation. On the other hand, clear morphological differences between the populations of different deeps may probably occur without any isolation. *Elpidia glacialis* shows subspecific differences between the populations of the Sunda, Kermadec, and New Britain Trenches. But the subspecies from the Sunda Trench was nevertheless found south of Australia also, and, moreover, the subspecies from the Tasman Sea is as well characterized as those from the trenches.

No differences were found between the *Myriotrochus bruuni* from the Philippine Trench and that from the New Britain Trench.

To sum up, it is not possible at present to decide, whether the deep sea trenches contain species, which are not found outside these. But the investigations of the Galathea Expedition proved nevertheless that the trench faunas are well characterized as against the general abyssal fauna, and, moreover, that the faunas of different trenches have some features in common.

POSTSCRIPT

In a small, preliminary paper from a Russian deep sea expedition to the north-western part of the Pacific P. V. USCHAKOV (Isutschenie glubokovodnoi fauni, Priroda no. 6, pp. 100-102, 1952) among other animals mentions two species of holothurians taken in the south-eastern part of the Kurile Trench in 1949 at a depth of 8100 m.

One of them was *Elpidia glacialis*, taken in about a hundred specimens. The specimens are not described in the text, except that they are stated to be up to 5 cm long. A portrayed specimen, reproduced here, shows, however, four pairs of small, fairly regularly distributed dorsal papillae. The similarity to the specimens from the New Britain and especially to those from the Kermadec Trench is striking. *Elpidia glacialis kermadecensis* had usually five, but occasionally four or six pairs of papillae. It would be interesting to know the number of papillae in the rest of the specimens from the Kurile Trench.

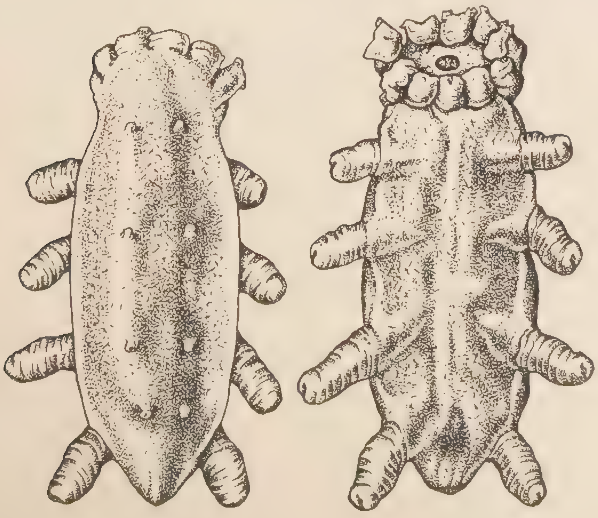

Fig. 25. *Elpidia glacialis*. (From USCHAKOV 1955).

Besides *E. glacialis* three specimens of an unidentified species of *Pseudostichopus* was taken. In the Galathea material this genus was represented by *P. villosus* which occurred in the Kermadec Trench down to a depth of 7000 m.

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ON TWO BATHYPELAGIC HOLOTHURIANS
FROM THE SOUTH CHINA SEA

Galatheathuria n. g. *aspera* (Théel) and *Enypniastes globosa* n. sp.

By BENT HANSEN & F. JENSENIUS MADSEN
Zoological Museum, Copenhagen

The Echinoderms are almost all benthonic in their adult stage. The Comatulidae, or Feather-Stars, are able to swim up from their resting place by alternating up- and downwards movements of their arms, and also some Holothurians may swim freely over the bottom; but these animals all the same belong to the bottom fauna. Only one group of Echinoderms, the Pelagothuridae within the Holothurioidea, are known to live a pelagic life.

In the literature also two fossils have been recorded as pelagic Holothurians, but erroneusly. The one, *Lorenzinia,* SIMONELLI 1906, Bologna Mem. Acc. Sc. 1905 (6) 2, is a Medusa, the other, *Eldonia,* WALCOTT 1911, Smiths. Misc. Coll. 57, 3, is a Siphonophore (MADSEN, in press).

The bathypelagic Holothurians, comprising the two genera *Pelagothuria* and *Enypniastes* (= *Planktothuria),* are gelatinous Medusa-like creatures without calcareous skeleton. *Pelagothuria* has a small body with a large swimming brim which almost surrounds its mouth and by means of which it floats in the deep-sea with the mouth upwards, now and then gently flapping the brim against the body. *Enypniastes (Planktothuria),* on the other hand, is buoyant by means of a very thick gelatinous bodywall in which its papillae are almost concealed. These two forms may perhaps be ranged in the order of Elasipoda and are probably neotenic, but further investigations are needed for establishing with certainty their systematic position.

HÉROUARD noted in 1923 (Monaco Res. 66, p. 97) that the swimming brim of CHUN's *Pelagothuria,* contrary to CHUN's opinion, does not comprise the ventral radius, and HEDING stated in 1950 (Zool. Anz. 145) that also specimens of *Pelagothuria* from the type-locality of LUDWIG's *P. natatrix* had an open swimming brim. Examinations of fresh specimens onboard the Galathea enabled us to confirm that in *Pelagothuria* this brim really is a very enlarged laterodorsal veil, comparable to that found in many bottom Elasipods, and that the hitherto published figures of *Pelagothuria* are artistic reconstructions.

A power of swimming freely over the bottom is known, as said above, for some other Holothurians. It was first observed by M. SARS in his *Stichopus natans (Bathyplotes n.)* which is a rather solid Holothurian, in outer appearance much like a shallow water *Holothuria* s. str. SARS's description of the remarkable phenomenon was given in the Norwegian language and we think it worth while therefore to repeat it here in translation. SARS says (Vidensk. Selsk. Forhandl. 1867, p. 4): "The most remarkable feature of the present animal, by which it differs from all other hitherto known Holothurians, is its ability to rise from the bottom and perform swimming movements. These take place as in leeches and certain planarians by powerful and quick snake-like bends of the body, and this in up and down directions (no side-bends) almost in the shape of an S."

A note on swimming Holothurians is also found e. g. in GILCHRIST's paper of 1920 (Quart. J. Micr. Sc. 64). GILCHRIST says that "It has been observed . . . that some of the Holothurians procured in deep water off the South African coasts have the power of swimming about freely in the water by an undulatory movement of the body", and "Probably such deep-sea Holothurians do not bury themselves in the soft mud of the floor of the ocean, but flit more or less readily over its surface."

Probably a power of swimming, though often akward, may be attributed to a considerable number of Holothurians of the family Psychropotidae within the order Elasipoda and of the genera *Bathyplotes* and *Paelopatides* within the Synallactidae of the order Aspidochirota. These Holothurians have an elongate and flattened body with powerful longitudinal muscles, and the body is also often surrounded by a lateral brim, which may facilitate

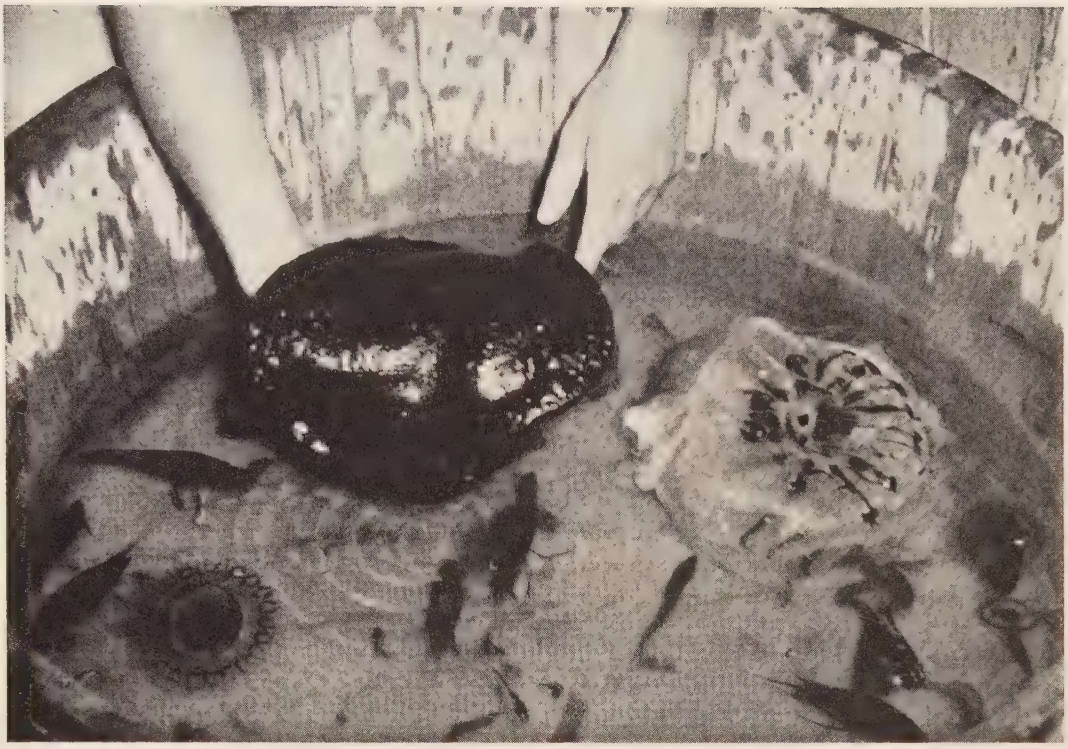

Fig. 1. The content of the trawl from the pelagic haul made by the Galathea in the South China Sea at an estimated fishing depth of 3400-3800 m. *Enypniastes globosa* n. sp. floats in the tub. *Galatheathuria aspera* (Théel) is lifted up with the oral side upwards.

swimming, though its primary function probably is to offer a larger surface for resting on the soft mud.

Most Psychropotids and species of *Paelopatides* are of a violet colour and often with the ventral side the darker. In a posthumous paper of 1938 by ÖSTERGREN (Studien über die Seewalzen, Göteborgs Vetensk. och Vitterh. Samh. Handl. (5) B. 8, p. 89) some remarks on this characteristic are found which we repeat here in translation, but do not comment on. ÖSTERGREN says: "In the depths where these animals live, no sunray penetrates. The bottom reflects more or less the light produced by the phosphorescent animals, but the water, on the contrary, does not. The dorsal side of the Holothurian must reflect the light just as much as does the bottom, if the animal should not de discerned from above, whereas, when the animal swims over the bottom, the ventral side must absorb the light as completely as possible if the animal should be concealed also from enemies coming from below."

With reference to these introductory remarks it can be understood that from an echinodermological point of view the pelagic haul made by the Galathea Expedition, July 1951, in the South China Sea with a triangular otter trawl of a spread of 13 m was a great success since it gave these two remarkable animals: A record-sized Pelagothurid of about 25 cm in diameter, and a cushion-shaped animal unlike any pelagic animal hitherto known and only by a closer examination recognized as a Holothurian, of the species *Paelopatides aspera* Théel 1886 which we, however, consider to represent a new genus: *Galatheathuria*.

Galatheathuria nov. gen.

Large free-swimming Holothurian (Family Synallactidae within the order of Aspidochirota). Body broad oval, divided into a main body with a lateral brim (by undulations of which the animal is supposed to swim) and a head-like fore-end without a swimming brim. Mouth central on the ventral side of the fore-end. Tentacles rather dendritic and completely retractile. Anus dorsal posteriorly. Midventral radius with a few pairs of pedicels posteriorly. Some very small papillae in each dorsal radius. Respiratory trees present. Calcareous bodies: Simple crosses with a high central projection. Genotype: *Paelopatides aspera* Théel 1886.

The new genus is most nearly related to *Paelopatides* in which the only known species, *G. aspera*, was also placed by THÉEL when it was first described. *Gala-*

theathuria is distinguished from *Paelopatides,* however, by the development of a distinct head-like fore-end and by the calcareous bodies which are crosses with a high central projection, as otherwise typical of the Psychropotidae within the Elasipoda. The sclerites of *Paelopatides,* if present at all, are usually rods or three-armed bodies; in a few species, however, four-armed bodies occur, but these are of the usual synallactid type with the ends of the arms enlarged and provided with a varying number of holes.

Galatheathuria aspera (Théel 1886)

Pl. I, 1-3

Pelopatides aspera Théel 1886, p. 157, pl. X, 13.

The single specimen described here was collected at the Galathea st. 407 in the South China Sea, 12°10′ N., 114°56′ E., depth 4500 m. It was caught in a pelagic trawl with an estimated fishing depth of 3400-3800 m.

In addition four specimens of this species were taken by the Galathea in the Bay of Bengal at st. 314, 15°54′ N., 90°17′ E., depth 2580-2610 m. But since they were caught in a bottom trawl they are not as finely preserved as the specimen from the South China Sea. These specimens will be described later in the Galathea Reports.

The specimen from the South China Sea measures 22.5 cm in length and, inclusive of the lateral brim, 15 cm where broadest. It was about 6 cm high when caught, but in the present preserved state, with its turgor lost, it is completely flat. The ventral side was much more vaulted than the dorsal side. The length of the head-like fore-end is about 6 cm. The whole main body is provided with a 10-12 mm broad lateral brim continuing round the posterior end and reaching about 3 cm inwards over the fore-end. The lateral brim includes on either side 13 and 14 papillae respectively, which give the brim a slightly dented margin. The dorsal surface is of a uniform appearance, with 6 small and slender, very indistinct papillae, up to 4 mm long, evenly distributed along each of the dorsal ambulacra. The anus is indicated by a small hole in the dorsal midline about 1 cm from the posterior end. The head-like fore-end, which is somewhat broader than long, bears the mouth centrally on the ventral side. The fore-end has no swimming brim or lateral papillae, but along the edge there is a very narrow rim. On the ventral side of the head a 1.5 cm, or more, broad marginal zone with faint radiating furrows is marked off indistinctly from the rest of the oral surface. Most posteriorly on the main body there are 5 pairs of small midventral pedicels.

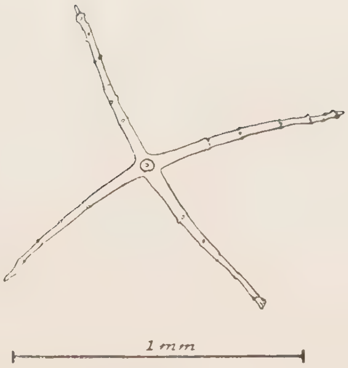

Fig. 2. *Galatheathuria aspera* (Théel).
Sclerite from the bodywall.

The tentacles were completely retracted and we have judged it inexpedient to dissect the unique animal in order to state their number, but one tentacle was extruded and found to be dendritic, not at all shield-shaped as is usual in the Aspidochirota and Elasipoda. Perhaps the dendritic shape is correlated with the free-swimming life of the animal; also *Pelagothuria* has tentacles which are not of the usual type, but more dendritic.

A cut in the posterior end of the animal made it possible to state that respiratory trees were present as in other Aspidochirota. The sclerites, as mentioned above, point, however, rather to the Elasipoda.

The body wall is densely provided with cross-shaped sclerites with long, slender, slightly inwardly bent arms and a central projection, which reaches into a small protuberance of the body wall. This gives the whole surface of the animal a curious shagreen-like character. The largest crosses have arms about 0.7 mm long and central projections about 0.3 mm high, but most sclerites are somewhat smaller. The arms and the spire are provided with some small spines, which are mostly placed in a few transverse rows. The sclerites are alike in the dorsal and ventral body wall, but are very small in the oral area. Sclerites with 5 arms occur scatteredly.

We have referred the present specimen to the species *aspera* erected by Théel 1886 (Challenger Rep. 14, pt. 39, p. 157) for a specimen collected by the Challenger in the Philippine Sea, 12°21′ N., 122° 15′ E., depth 1320 m, a locality very near the Galathea st. 407. Théel's specimen was 12.5 cm long and 7.5 cm broad, thus half as long as the present one; its colour in alcohol was a dark brownish-violet, and the present specimen is likewise dark violet in alcohol (darker in this state than when caught). When one reads Théel's description it is not immediately clear that he is describing the species to which the present specimen belongs. The anterior part of the body was surrounded by a broad brim, forming "a large transverse lobe", which was not continuous with the brim round the main body. This brim was formed by the "very thick sides of the body", the margin of it being much thinner, and this margin "may strictly be considered as the true brim". A comparison of the present specimen in the preserved state with the specimen described by Théel gives, however, the clue to his description. The margin of the head, corresponding to the marginal zone which is visible on the ventral side in the living animal, is now rather lobe-like after the collapse of the animal. The margin of the main body, on the contrary, is hardly to be discerned from the body itself. Obviously, the part of the brim which was formed by the thick sides of the body in Théel's specimen, and not the margin of it, was the true brim. There can be no doubt that he had before him the same species as we, since also his description of the sclerites agrees with those of the present specimen. Their characteristic feature, the small spines in transverse rows, seems, however, somewhat exaggerated in his figure (pl. X, 13). The enlarged ends of the arms in Théel's figure are probably due to a misinterpretation: The arms are in fact pointed, but the points are often broken off just distal to a ring of spines; thus the arms seem to terminate in a bunch of spines.

The colour of the present animal in a fresh state was a dark violet, indicating that it came from the abyssal part of the ocean. It is evident from the find, that the animal may swim up high over the bottom; but maybe it does so only more occasionally, otherwise resting on the bottom. The animal at least does not live entirely in the free water, since we found in the intestine some sand-incrusted foraminiferans of two types, some other bottom foraminiferans, sponge spicules, and various chitinous fragments, though also some remains of the pelagic *Coscinodiscus,* some radiolarians, and some *Globigerina.*

Ekman (Zool. Jahrb. 47, 1925, p. 525) likewise found bottom material in the rectum of one of Théel's specimens of *Enypniastes eximia,* indicating that this species also is to some degree dependent on the bottom.

Though *Galatheathuria* may spend much time on the bottom, it nevertheless seems to be better suited for active swimming than any other described Holothurian: It also floated in the tub where it was put after the capture. The swimming of *Galatheathuria* no doubt takes place by undulations of the lateral brim, similar to the way of swimming of the cuttlefish *Sepia.* There is, indeed, much similarity in the general shape of these two quite unrelated animals.

Enypniastes globosa n. sp.
Pl. I, 4-5

The said pelagic haul in the South China Sea also yielded a very large Medusa-like Pelagothurid of the genus *Enypniastes,* about 25 cm in diameter, which is record size for such animals. The specimen was in a beautiful condition when caught, as illustrated by the photographs, and showed still some signs of life, the tentacles reacting by faint contractions when pinched. In the tub it floated with the mouth upwards.

It represents probably a new species which may be diagnosed as follows: Pelagic Holothurian of the genus *Enypniastes,* of large size and with an almost globular body, and with a tentacle crown covering almost the whole ventral side. Anus subdorsal. Anteriorly, a wreath of 12 large, dorsolateral papillae, and behind this wreath 3 pairs of small dorsal papillae. On the posterior half of the body 9 pairs of ventro-lateral papillae, of which the posterior 6 are distinctly smaller than the 3 anterior ones.

Type-locality: Galathea st. 407, South China Sea, 12°10′ N., 114°56′ E., depth 4500 m, estimated fishing depth 3400-3800 m. Since the animal was still alive some time after being taken, it was probably not caught at the estimated fishing depth of the trawl, but nearer the surface.

The type is preserved in the Zoological Museum of Copenhagen.

In a recent paper on the pelagi Holothurians Heding (Zool. Anz. 145, 1950) discussed the synonymics of the species of *Enypniastces, Euriplastes,* and *Planktothuria.* He is undoubtedly right in regarding the two latter genera as synonyms of *Enypniastes,* but it seems rather improbable that he is right when he lumps all the described forms together into two species, *E. eximia* Théel and *E. ecalcarea* (Sluiter). Moreover, the two species, as defined by Heding, apparently can not be distinguished; according to Heding *eximia* should be distinguished by a larger number of dorsal papillae, but an examination of the literature shows that this is not true. Maybe, even more species than recognized in the literature ought to have been erected. The *eximia* of Théel (Chall. Rep. 4, pt. 13, 1882, pl. VIII, 6-7), of Sluiter (Siboga-Expeditie, 44, 1901, pl. II, 8-9), and of Mitsukuri (J. Coll. Sc. Tokyo Imp. Univ. 29, 1912, pl. VII, 59-60) are possibly three different species.

In regard to the large tentacle crown the present specimen most resembles *E. eximia* as portrayed by Sluiter, though in this species, which was taken by the Siboga at the Moluccas at a depth of 567 m, the tentacle crown extends to only half the ventral side. Another similarity is shown by the ventro-lateral papillae which also in Sluiter's specimens are of two types, the posterior 8 pairs being shorter that the anterior 5 pairs. But, apart from the different number, the papillae in *E. globosa* differ from those of Sluiter's specimens in being confined to the posterior half of the body, whereas they extend along the whole length of the body in Sluiter's specimens.

The present specimen had the oral side flattened, with the mouth almost central and surrounded by 19 tentacles of which the anterior 12 are subequal and up to about 9 cm long, whereas the posterior 7, likewise subequal, are less than half as long. This segregation of the tentacles in long and short ones is perhaps a good distinguishing character of the species. The tentacles end in a fringed disc following a slender neck and are similar to those described and portrayed by Mitsukuri for *E. eximia*. The oral disc and the tentacles are light brownish with the head of the tentacles somewhat darker; otherwise the animal is light bluish, transparent. The 12 dorsolateral papillae of the anterior wreath are up to 7 cm in length, and the 3 pairs of dorsal papillae are about 1 cm long. Of the 9 pairs of ventro-lateral papillae the 6 posterior ones are subequal, conical, up to about 1.5 cm long, whereas the 3 anterior ones are stouter, cylindrical, up to about 5 cm long.

The globular shape of the animal, by which it differs from all the hitherto known species of the genus, is mostly due to the gelatinous tissue of the body wall, whereas the body itself is more oblong. In this gelatinous coat the papillae are almost completely imbedded; only 2-3 cm of the large dorsolateral papillae and the tips of the long posterior papillae are free.

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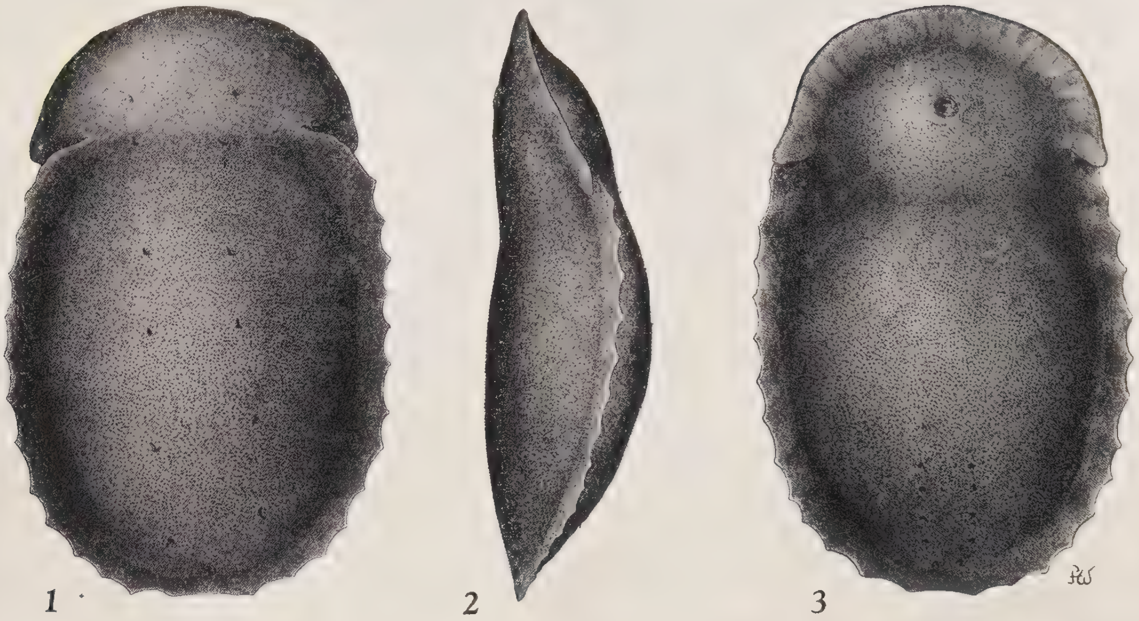
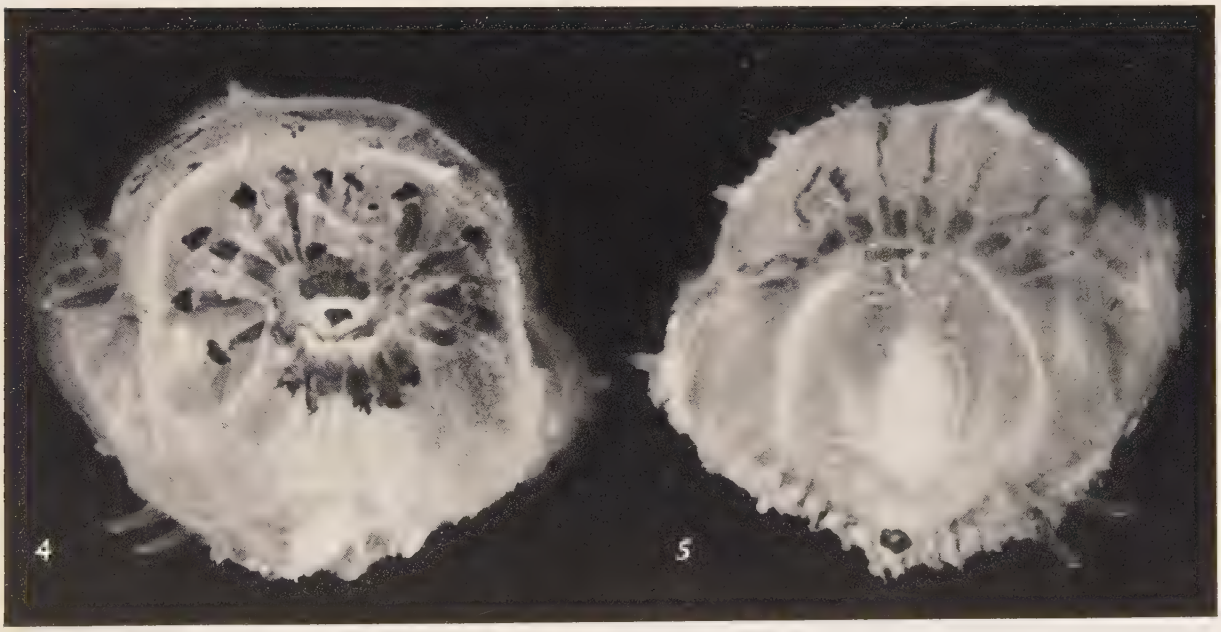


Figs. 1-3. *Galatheathuria aspera* (Théel) in dorsal, lateral, and ventral view. The drawings are based on sketches made from the animal in fresh state. The dorsal papillae are somewhat exaggerated in the figure. (*Poul H. Winther* del.)



Figs. 4-5. *Enypniastes globosa* n. sp. Photos of the living animal from the ventral and the dorsal sides respectively.

CRINOIDS

FROM DEPTHS EXCEEDING 6000 METERS

By TORSTEN GISLÉN †
Zoological Institute, Lund, Sweden

Several species of comatulids as well as stalked crinoids were collected during the Galathea Expedition in depths shallower than 6000 m, but only one locality in greater depth, the Kermadec Trench, yielded crinoids.

In 1869 the Porcupine Expedition secured a stalked crinoid, a *Bathycrinus,* from a depth of 4450 m in the Bay of Biscay. For a long time this was the deepest find of crinoids. The same species, *B. gracilis,* was collected in 1896 at a depth of about 5000 m, not far from the type-locality. During the Swedish Deep Sea Expedition in 1948 another species of the same genus was collected in the Mid-Atlantic in a depth of 5800 m. The family of the Bathycrinidae was repeatedly taken by the Galathea Expedition. It is represented by three genera in the collections. Still only one member of the genus *Bathycrinus* was recorded from depths exceeding 6000 m. This crinoid was found in an abyss of 8300 m, thus surpassing the earlier crinoid records by no less than 2500 m.

Bathycrinus australis (A. H. Clark)

Pl. 1.

For earlier literature see A. H. Clark 1915.
Ilycrinus australis A. H. Clark 1915 p. 154 ff.
Bathycrinus australis Gislén 1939 p. 16.

The Galathea Expedition 1950-52 St. 649. 35°16′S. 178°40′W. The Kermadec Trench. 8210-8300 m.

Description.

Crown 1: Stem of a proximal diameter of 1.8 mm. About 20 short segments before the one attaining L = br. Stem diameter here 1.1 mm. Distance from base of BB to a stem-joint having L = br: 8.5 mm.

Basal ring: diameter 1.9 mm, h = 1 mm, diameter of radial ring proximally 1.9 mm, distally 3.5 mm. Each RR: br. 1 mm proximally, 2 mm distally, h 1.3 mm. I Br 1 + 2: h 4.2 mm. I Br 1: br 1.8 mm proximally, 2 mm distally, h 2.2 mm. I Br 2: br proximally 2.0 mm, distally 2.2 mm, h 2.0 mm. An indistinct knob dorsally at joint between I Br 1 and 2. Arms from I Br 1 to Br 5: 10 mm. A median rounded thickening along the dorsal side of the arm segments. The lateral sides of the arms in close contact with their corresponding neighbours by thin flanges running from I Br 2 to Br 2 or 3 on the outer sides of the arms and from Br 2 to Br 4 or 5 on the inner sides.

Articulations of the arm-bases Br 1 + 2 3 4 + 5, arms broken distally. Arms smooth with insignificantly thickened rims at articulations.

Crown 2: Proximal stem joints almost fused into one ossicle. Length of this part 3.5 mm. Diameter of stem proximally 1.6 mm, at segments L = br about 1.0 mm. Short joints about 20 segments. I Br 1 to Br 5: 9.8 mm. Proximal arm segments 1 + 23 4 + 5 6 7 + 8.

Crown 3, broken between BB and RR:

I Br 1 to Br 5: 10.5 mm. On the inner sides of the arms the flanges continue from Br 2 to Br 6 or 7. Articulations of arm-bases: 1 + 2 3 4 + 5 6 7 + 8 9 10 + 11 or 1 + 2 3 4 + 5 6 + 7 8 9 + 10 11. Pinnules begin distally of Br 11? Arms smooth.

Crown 4: A very small specimen. Only RR – I Br 2 – Br 4 present. Length 4.5 mm.

Several stem fragments:

Joints in median parts of stem smooth. Length quickly becoming = 2 br. Then increasing still more, L = 3 br, the joints growing slightly knobby at the articulations, sometimes with faintly discernible syzygies in the middle part. Length of ossicles about 3 mm, diameter of medial part 0.8 mm, at articulations 1 mm. In more distal parts of stem shorter joints again and still larger knobs at the articulations.

Distal parts of stem very much thickened at articulations. Length of stem joints 4.5 mm, medial part narrower, diameter 1.5 mm. Knobs at articulations: broadest diameter 2.9 mm, narrowest diameter 2.0 mm. Broadest articulation as usual alternating with 90° for each consecutive joint. Distal ossicles shortened to L = $1^1/_5$ medial br. Distalmost ossicles with smoother joints, branched, with rhizoids. Longest stem-fragment 75 mm.

There are in addition 4 smaller and thinner stems, broken between RR and BB. Basal ring br 1.2-1.6 mm. Proximal part of stalk with a diameter 1.0-1.2 mm. About 15-20 short segments. Diameter of stem joint at L = br 1.0 mm. The proximal part of the stem with these short ossicles totalling 5 to 6 mm.

The two species *B. aldrichianus* Wyv. Thomson and *B. campbellianus* P. H. Carpenter represent in fact the same species. Dr. CARPENTER's *aldrichianus*, on the other hand, is something quite different from what WYV. THOMSON originally designated by the same name. Therefore, A. H. CLARK in 1907 p. 553, clearing up the whole complicated story, proposed a new name, *australis*, for *aldrichianus* sensu P. H. Carpenter.

B. aldrichianus Wyv. Thomson is a mid-atlantic species which was refound by the Swedish Deep Sea Expedition in the vicinity of the type-locality and described by me in 1951 (p. 51). Furthermore, under the name of *B. serratus* it was recorded from off Virginia and Maryland by A. H. CLARK in 1908 (p. 205).

B. australis, on the other hand, was hitherto recorded from two localities only, from between Crozet Island and Enderby Land.

The two species *australis* A. H. Clark *(aldrichianus* sensu P. H. Carpenter) and *aldrichianus* Wyv. Thomsen *(campbellianus* sensu P. H. Carpenter) seem to be two well distinguished species, belonging to a group of Bathycrini which has more than 15 short proximal stem joints. *(B. australis* was figured under the name of *aldrichianus* by CARPENTER 1884 Pl. 7, and by DÖDERLEIN 1912 Pl. 6 fig. 7 under the name of *australis*. *B. aldrichianus* Wyv. Thomson was figured by CARPENTER 1884 pl. 8 under the name of *campbellianus*, by A. H. CLARK 1908, p. 206, under the name of *serratus*, and by GISLÉN 1951 Pl. 1 fig. 1 under the name of *aldrichianus*).

Judging from the facts known *australis* seems to have the arms perfectly smooth, except for a small knob at the syzygies. The I Br. 1-2 are rather long with I Br 2 being as long as or longer than broad. These ossicles are rather broadly flanged and have a median rounded swelling along the dorsal side. *B. aldrichianus*, on the other hand, has serrate arms with rather short I Br 1-2, I Br 2 having the length shorter than the breadth. The dorsal side of the arm-joints in *aldrichianus*, as figured by H. P. CARPENTER under the name of *campbellianus* and well visible in the specimen from the Swedish Deep Sea Expedition too, is provided with some longitudinal low ridges, and has no knobs at the syzygies. Apart from an insignificant out-bending of the proximal part of the RR and a very tight fusing together of the short proximal stem-joints in the specimens obtained in the Kermadec Trench, I can see no difference between these and those formerly found of *B. australis*.

This new find from the Kermadec Trench extends the distribution of *B. australis* very considerably. It is evident that it must be regarded as an antarctic species occurring in deep to very deep water circum-antarctically. The occurrence at a depth surpassing that of the other known Bathycrini by 2500 m and that of former records of *B. australis* by 3650 m is remarkable.

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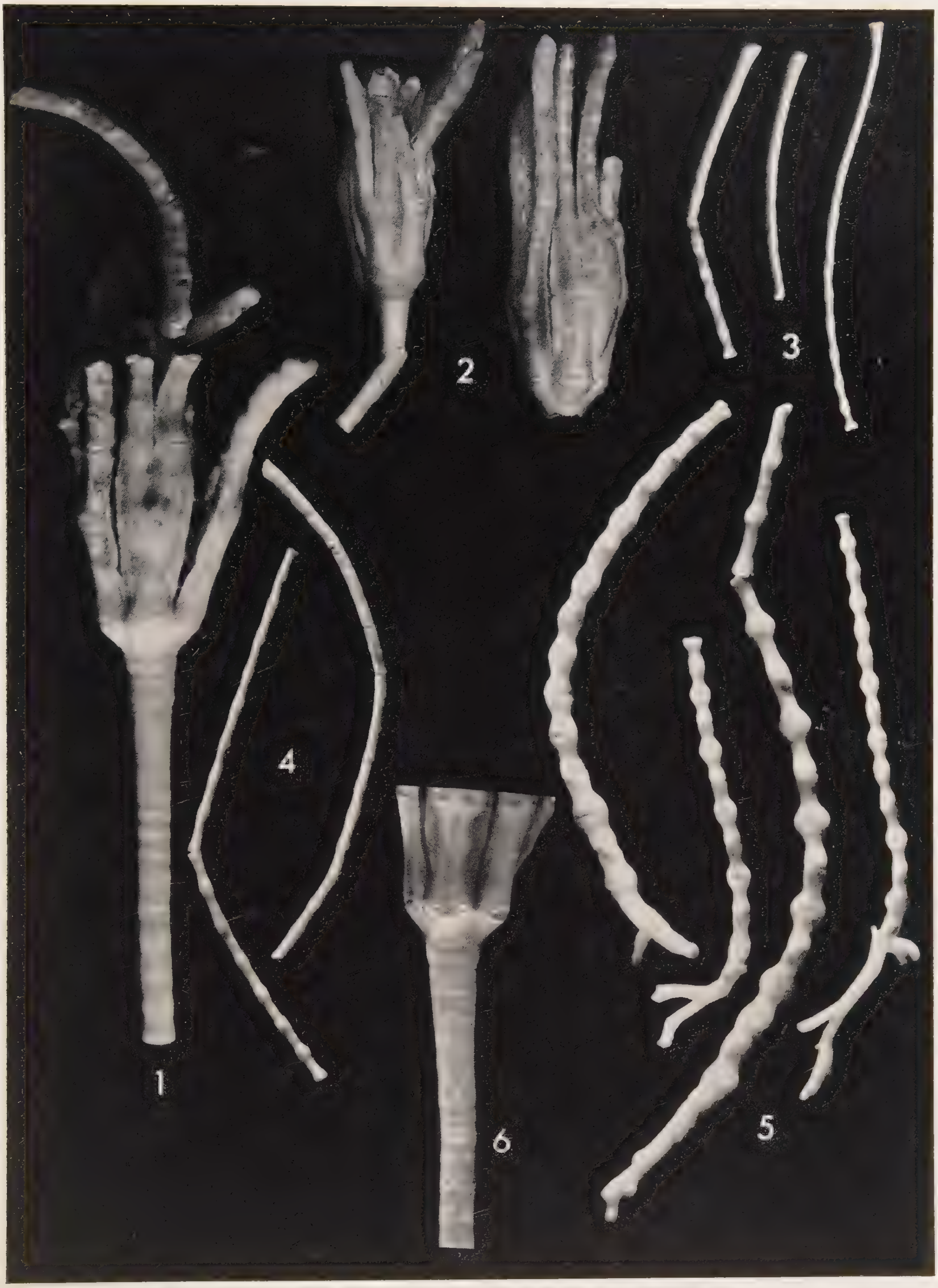

Bathycrinus australis.

Fig. 1. Crown 1, ×4,5. Fig. 2. Crown 2 and 3, ×3. Fig. 3. Three specimens with basal rings retained, but the crowns lost, ×2. Fig. 4. Two examples of median stem-parts, ×2. Fig. 5. Four distal stem-parts with rhizoids, ×2. Fig. 6. Crown 1 photographed in toluene, ×5.

BENTHIC POLYCHÆTA
FROM DEPTHS EXCEEDING 6000 METERS

By J. B. KIRKEGAARD
Zoological Museum, Copenhagen

INTRODUCTION

The material of Polychætes from depths greater than 6000 m obtained by the Galathea-Expedition 1950-52 comprises 21 species, of which 15 were determined to species and 3 only to genus. The remaining 3 are so fragmentary, that they could only be determined to family.

The following species were found:

1. *Macellicephala abyssicola* Fauvel
2. *Macellicephala hadalis* n. sp.
3. *Ancistrosyllis constricta* Southern
4. *Nereis profundi* n. sp.
5. *Nepthys elamellata* Eliason
6. *Ninöe fusca* Moore
7. *Tharyx multifilis* Moore
8. *Ilyphagus bythincola* Chamberlin
9. *Travisia profundi* Chamberlin
10. *Kesun abyssorum* Monro
11. *Ammotrypane galatheae* n. sp.
12. *Maldanella harai* (Izuka)
13. (?) *Petaloproctus cirratus* Monro
14. (?) *Owenia lobopygidiata* Uschakov
15. *Terebellides eurystethus* Chamberlin

Three of these species are new to science, they are known only from depths greater than 6000 m, and probably represent a special hadal fauna.

Previously we had finds of eleven species of Polychætes from depths greater than 6000 m. Two of these are from the Swedish Deep-Sea Expedition 1947-48 (Eliason 1951). At St. 370 of this expedition, at depths from 7625 to 7900 m, a fragment of a *Macellicephala*, and some empty tubes, probably of a Terebellid, were found. From the Soviet Expeditions to the Kurile-Kamtchatka Trench seven species are at present described from depths greater than 6000 m (Uschakov 1955b). Five of these are new to science. The species are: *Macellicephala mirabilis* 7210-7230 m (6 spec.), *Macellicephala zenkevitchi* 8100 m (1 spec.), *Macellicephaloides grandicirra* 8100-9950 m (43 spec.), *Macellicephaloides verrucosa* 7210-7230 m (3 spec.), *Macellicephaloides vitiazi* 7210-8430 m (2 spec.), *Vitiazia dogieli* 8100 m (1 spec.) and *Amphicteis mederi* 8100 m (20 spec.). Besides a *Lumbriconereis* sp. and a *Potamilla* sp. were found at 8100 m (Uschakov 1952).

The 21 species from the Galathea-Expedition were collected at the following 14 stations:

Philippine Trench

St. 418. 10°13'N 126°43'E 10190 m *Macellicephala hadalis?*
St. 419. 10°19'N 126°39'E 10160-10210 m *Macellicephala hadalis?*

Sunda Trench

St. 462. 10°02'S 107°52'E 6740 m *Ilyphagus bythincola, Kesun abyssorum.*
St. 465. 10°20'S 109°55'E 6930-7000 m *Ampharetidæ* II.
St. 466. 10°21'S 110°12'E 7130-7160 m *Macellicephala abyssicola.*

Banda Trench

St. 494. 5°36'S 131°01'E 7280 m (?) *Petaloproctus cirratus, Jasmineira* sp.
St. 495. 5°26'S 130°58'E 7250-7290 m *Macellicephala abyssicola, Macellicephala hadalis, Nereis profundi, Travisia profundi, Ammotrypane galatheæ,* (?) *Petaloproctus cirratus.*
St. 497. 5°18'S 131°18'E 6490-6650 m *Travisia profundi, (?) Owenia lobopygidiata.*
St. 499. 5°21'S 131°17'E 6580 m *Ancistrosyllis constricta, Tharyx multifilis, Travisia profundi, (?) Owenia lobopygidiata.*

Kermadec Trench

St. 649. 35°16'S 178°40'E 8210-8300 m *Macellicephala hadalis, Kesun abyssorum, Notomastus sp., Myriochele* sp., *Jasmineira* sp.
St. 650. 32°20'S 176°54'W 6620 m *Macellicephala abyssicola, Nepthys elamellata, Ninoë fusca, Myriochele* sp., *Maldanella harai, Jasmineira* sp., *Serpulidæ.*
St. 651. 32°10'S 177°14'W 6960-7000 m *Macellicephala abyssicola, Macellicephala hadalis, Nephthys elamellata, Ninoë fusca, Kesun abyssorum.*
St. 653. 39°09'S 176°35'W 6140-6160 m *Nephthys elamellata, Myriochele sp.*
St. 658. 35°51'S 173°31'W 6660-6720 m *Macellicephala abyssicola, Macellicephala hadalis, Nephthys elamellata, Ninoë fusca, Maldanella harai, Ampharetidæ* I, *Terebellides eurystethus.*

Further information about the stations is given in the main station list.

We have now traces of Polychætes from the greatest depths of the oceans, thus from the Philippine Trench at 10210 m some fragments of a Polychæte, which probably is a *Macellicephala hadalis* (see the descriptions). From 8210-8300 m in the Kermadec Trench (St. 649) we have 5 species, some of the specimens in so fine conditon that two species could be determined. These two species *Macellicephala hadalis* and *Kesun abyssorum* and *Macellicephaloides grandicirra* from the Kurile-Kamtchatka Trench are thus the deepest known finds.

All figurs were made by Mr. Poul H. Winther, scientific drawer, and the English manuscript was corrected by Mrs. Agnete Volsøe.

I wish to express my most cordial thanks to Dr. A. F. Bruun, the leader of the Galathea-Expedition, for letting me join the expedition and for having placed this interesting material at my disposal.

Description of the Material

FAM. APHRODITIDAE

SUBFAM. POLYNOINAE

Macellicephala abyssicola Fauvel 1913

(Fauvel 1914 pl. I fig. 9, pl. III figs. 4-5, 18-20)

Macellicephala abyssiocla Fauvel 1913 p. 7.
Macellicephala abyssicola Fauvel 1914 p. 41.
Macellicephala abyssicola Fauvel 1923 p. 44 fig. 15d-g.
Macellicephala abyssicola Eliason 1951 p. 132.

Material:

Sunda Trench: St. 466, 7130-7160 m, 2 spec., 2 fragm.

Banda Trench: St. 495, 7250-7290 m, 1 probosc.

Kermadec Trench: St. 650, 6620 m, 12 spec., 12 fragm., largest: 38 × 18 mm. St. 651, 6960-7000 m, 16 spec., 4 fragm., 1 probosc., largest: 43 × 20 mm. St. 658, 6660-6720 m, 1 spec., 2 proboscc.

Body short, flattened, broad. 17 setigerous segments. Prostomium bilobed with frontal filiform peaks. No eyes. Median tentacle with a large cylindrical ceratophore, inserted between the prostomial lobes. No facial tubercle. The palps are very long and smooth. Two pairs of tentacular cirri with basal setæ. 8 pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, but all the present specimens have lost the elytra. Parapodia elongate, with a long dorsal cirrus, inserted at a long distance from the base. No dorsal tubercle on segments without elytra. The dorsal ramus small, subulate, with serrated setæ. Ventral ramus longer, shaped like a narrow cone, contains long transparent setæ, flat, spatulate, with serration along the edge. Short subulate ventral cirrus, inserted at a long distance from the base. 2 large anal cirri. Proboscis long and violet as the body.

Although Fauvel indicates 18 setigerous segments it must be the same species since all other characters are quite similar.

Distribution: Bay of Biscay 4380 m, Canary Islands 4255-4872 m, Kermadec Trench 6620-7000 m, Sunda Trench 7130-7160 m, Banda Trench 7250-7290 m.

Macellicephala hadalis n. sp.

(Figs. 1-3)

Material:

? Philippine Trench: St. 418, 10190 m, 1 fragm. of the anterior part of the intestine, purplish coloured. St. 419, 10160-10210 m, 1 probosc., abnormal with 3 teeth.

Banda Trench: St. 495, 7250-7290 m, 2 fragm. with prost. and probosc.

Kermadec Trench: St. 649, 8210-8300 m, 41 fragm., some with a prost., and 32 probosc., one of these abnormal with 3 teeth. St. 651, 6960-7000 m, 8 fragm., some faintly purplish coloured, and 2 probosc. St. 658, 6660-6720 m, 33 spec., the largest: 62 × 25 mm. (Type-locality, type preserved in the Zoological Museum of the University, Copenhagen).

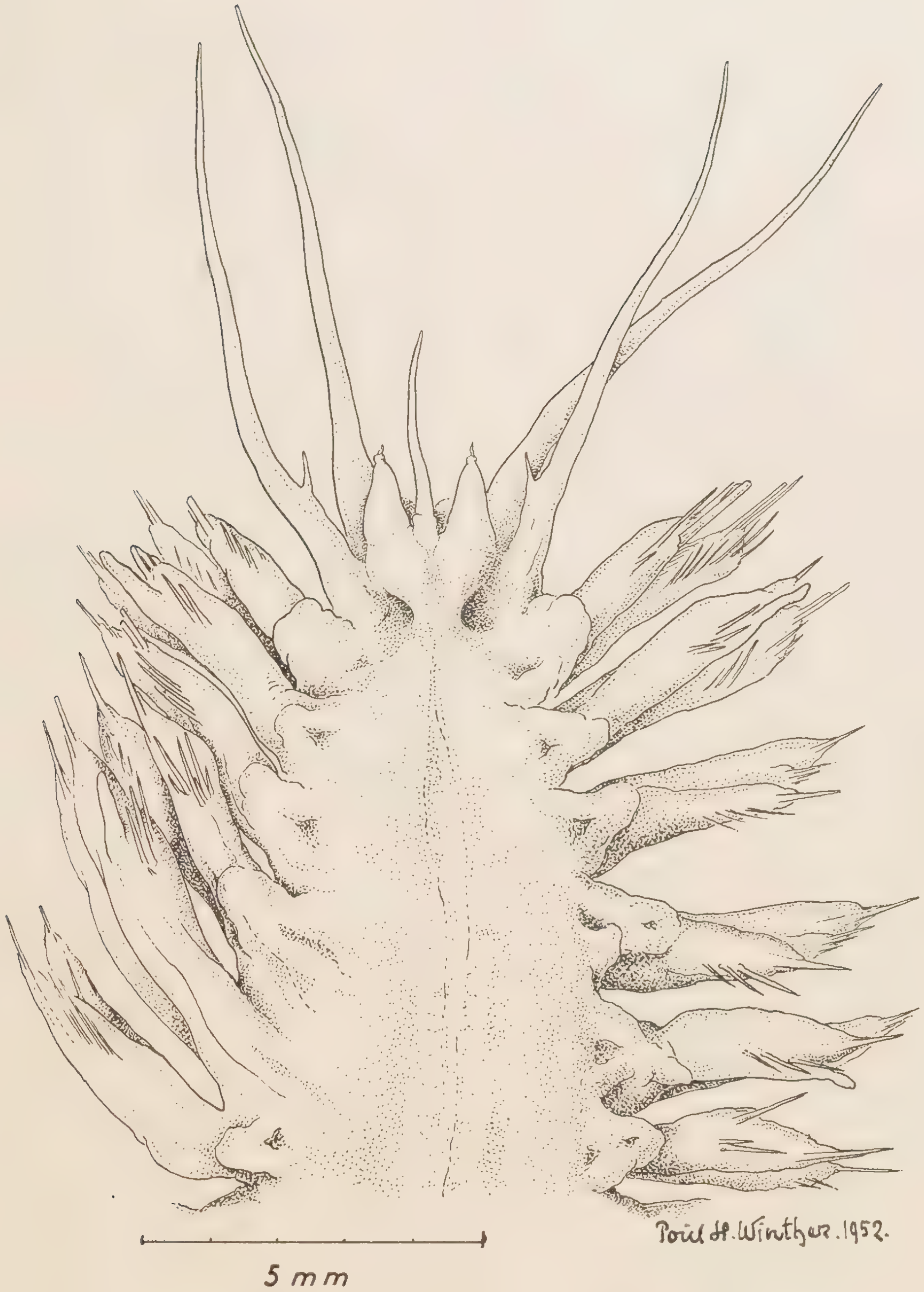

Fig. 1. *Macellicephala hadalis* n. sp. Anterior part.

Body broad and flat. 21 setigerous segments. The prostomium is deeply incised in front with two very long cone-shaped lobes, ending in a globe with a short filiform process. No eyes. A median tentacle separates the two lobes. The palps are smooth and taper from base to apex. Two pairs of tentacular cirri with basal setæ. The tentacular and dorsal cirri are also smooth and long, tapering. Ventral cirri small and filiform. Dorsal cirri inserted at a great distance from the base of the parapodium. The parapodia are elongate, the dorsal ramus small, but the ventral ramus long and cone-shaped, like the parapodia in *M. abyssicola*. 9 pairs of elytrophores on segments 2, 4, 5, 9, 11, 15, 17. No elytra are left in the present specimens. The dorsal ramus bears a comparatively small number of iridescent, stout setæ. They are fragile because of the large size of the internal cavity, lightly serrated on one side only and end in a blunt point. The ventral setæ are longer and extremely slender, transparent and more distinctly serrated on one side. The colour faintly purplish in some specimens, but most of them are pale, owing to the preservation.

This species must be very close to McIntosh's

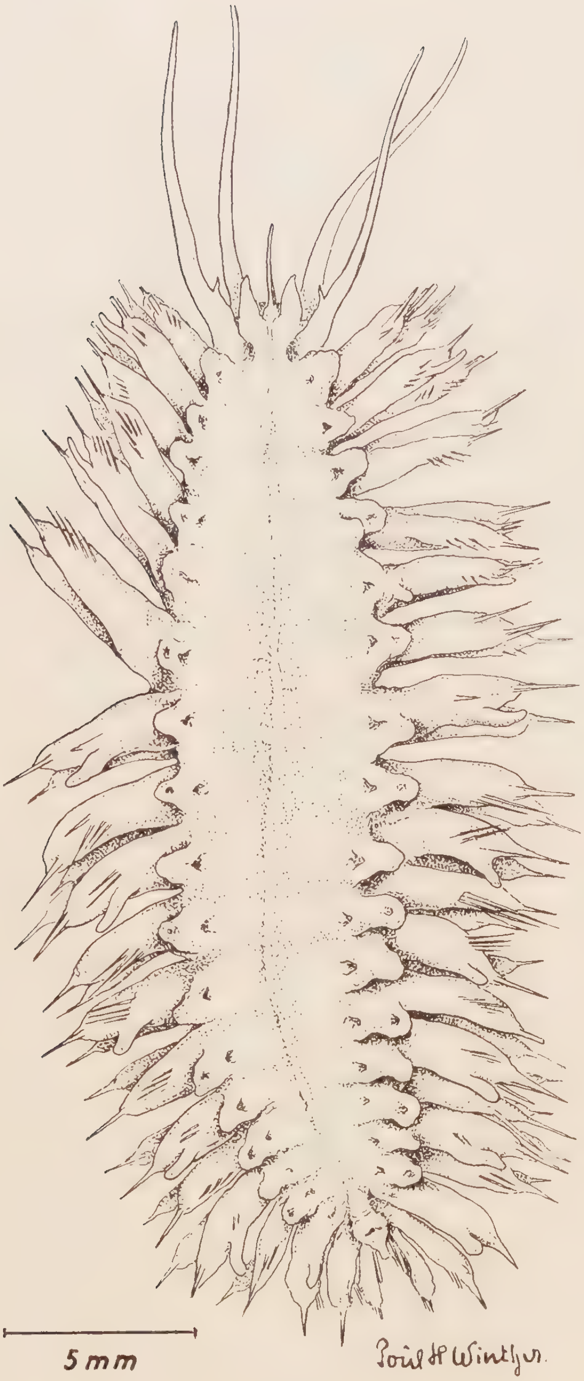

Fig. 2. *Macellicephala hadalis* n. sp.

species *M. mirabilis* from New Zealand (McIntosh 1885 p. 121), which certainly is identical with M. violacea (Levinsen). M. mirabilis is also a deep-sea species with a very wide distribution. *M. hadalis* differs from *M. mirabilis* in the number of segments, which in *M. mirabilis* is 18, longer and more cone-shaped prostomial lobes, tentacular cirri with setæ, not indicated in *M. mirabilis,* and more strongly serrated setæ. Possibly *M. hadalis* occurs only in the deepest deep-sea.

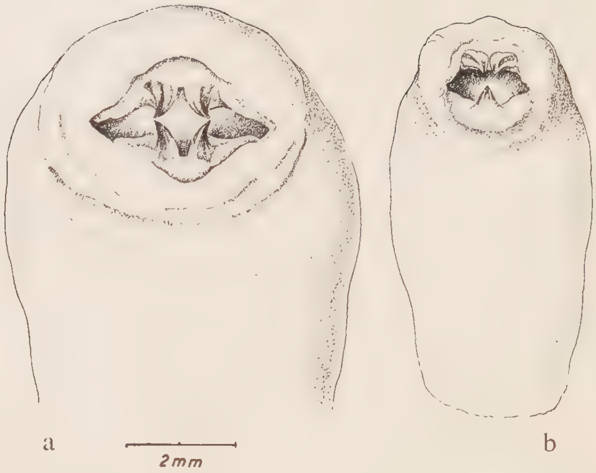

Fig. 3. a. Proboscis of *Macellicephala hadalis* n. sp.
b. Proboscis from the Philippine Trench.

From the Philippine Trench we have a proboscis with three teeth (fig. 3b). One of the teeth is triangular, but the two other teeth and the shape of the proboscis are just like those of *M. hadalis* (fig. 3a). Among several proboscises from the Kermadec Trench St. 649 I found one similar to the proboscis from the Philippine Trench. Uschakov (1955b) describes a new genus *Macellicephaloides* upon specimens from the Kurile-Kamtchatka Trench. The characters of this genus are: only three teeth, or four with two of the teeth sitting close together, and two long lateral cirri on the proboscis as in the family *Alciopidæ.* The present two proboscises have no lateral cirri, probably they have fallen off. The material is too poor to draw any conclusions, but I hope later investigations will clear up the problem.

Distribution: Kermadec Trench 6660-8300 m, ?Philippine Trench 10160-10210 m, Banda Trench 7250-7290 m.

FAM. HESIONIDAE

Ancistrosyllis constricta Southern 1921
(Southern 1921 pl. XIX fig. 1)

Ancistrosyllis constricta Southern 1921 p. 573.
Ancistrosyllis constricta Fauvel 1932 p. 64.

Material:

Banda Trench: St. 499, 6580 m, 1 spec., 11 mm, 60 setigerous segments.

Body anteriorly round, posteriorly flat. Greatest width at the anterior end, a distinct neck at short distance from the prostomium. Prostomium with

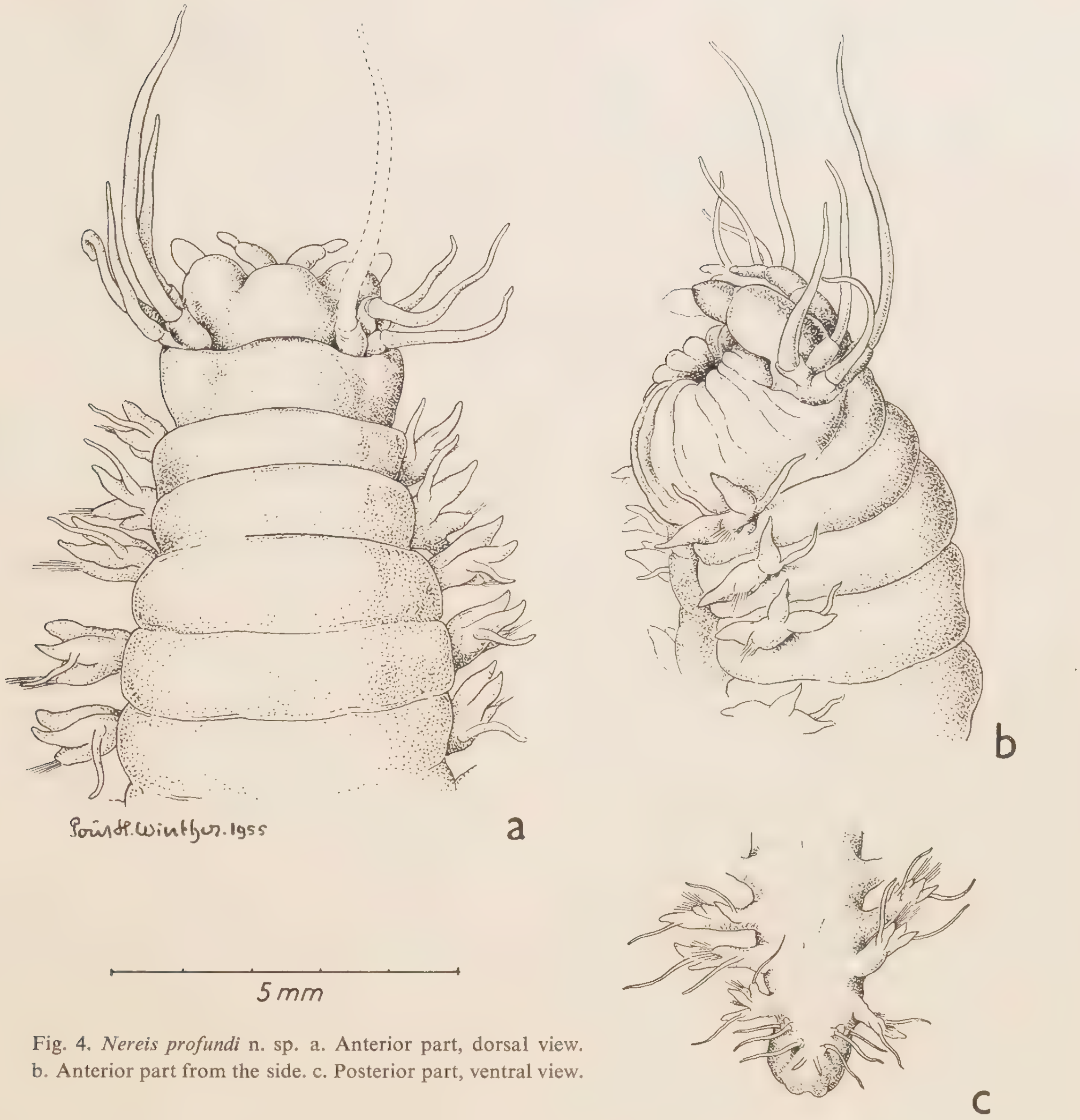

Fig. 4. *Nereis profundi* n. sp. a. Anterior part, dorsal view. b. Anterior part from the side. c. Posterior part, ventral view.

two flattened palps, fused in the median line. Each palp has a small terminal joint. Three tentacles, the median longest. No eyes. Two pairs of short tentacular cirri. Dorsal cirri of the first setigerous segment very long and tapering, at least three times as long as the ventral ones. Second setigerous segment with short dorsal cirri, no ventral cirri. An enclosed dorsal slender aciculum and posteriorly a stout sickle-shaped seta. In the anterior segments short ventral setæ among long ones, in the posterior segments only long setæ. The short setæ with coarse teeth, the long setæ are faintly serrated. Minute papillæ on the base of the dorsal cirrus.

Very close to *A. robusta* EHLERS from Great Fish Bay, SW-Africa.

Distribution: Chilka Lake, Vizagapatam (shallow water), Banda Trench 6580 m.

FAM. NEREIDAE

Nereis profundi n. sp.
(Fig. 4-6)

Material:

Banda Trench: St. 495, 7250-7290 m, 9 spec., including one complete, 7 fragments. Size of complete spec.: 69×8 mm. (Type, preserved in the Zoological Museum of the University, Copenhagen).

Body stout, tapering posteriorly. 64 setigerous segments in the only complete specimen. Prostomium short and very broad with two long biannulated tentacles. Palps long, large with long eggshaped distal joints. *No eyes of any kind; they seem to be quite blind.* Peristomium twice as large as the following segments. 4 pairs of tentacular cirri, the pos-

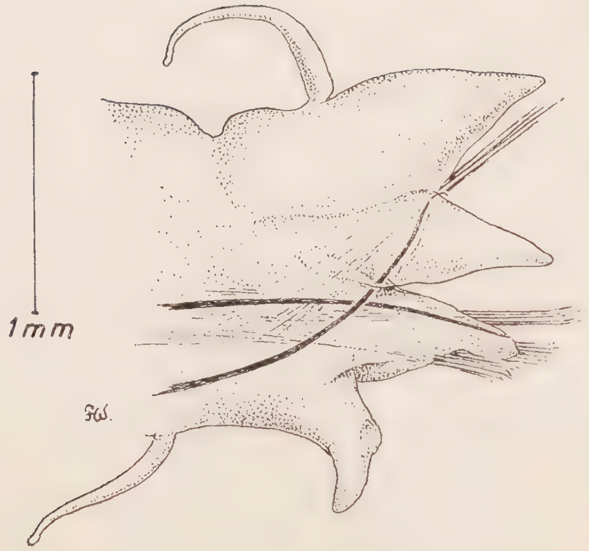

Fig. 5. Parapodium from the middle part of *Nereis profundi* n. sp. Front view.

terior ones reaching the 6th setigerous segment. The proboscis was withdrawn in all the specimens. A dissection showed two strong, dark-brown jaws with 5 teeth below the main fang. Numerous strong conical paragnaths were found in the proboscis, some of them separated from their original place, but most of them arranged in the following way: group I=6, II=14, III=25, IV=27, V=2, VI, VII, VIII=a single row of few paragnaths. These figures are perhaps not quite correct, as they were constructed on the seven specimens dissected. In none of these specimens were all the paragnaths situated in their original place, several were found flowing freely in the cavity of the proboscis. Two first pairs of setigerous segments uniramous, the following biramous with two lobes in the dorsal ramus and two fillets and one lobe in the ventral ramus (fig. 5). In the ventral ramus the posterior fillet is very short, rounded. No differences between the anterior and posterior feet. Dorsal cirri longer than the foot, ventral ones somewhat shorter. Dorsal setæ homogomph spinigerous, upper ventral setæ homogomph spinigerous and heterogomph falcigerous, lower ventral setæ heterogomph spinigerous and falcigerous. In the posterior feet dorsal homogomph falcigerous setæ are found (fig. 6). The terminal piece of these setæ is smooth. Acicula black. The last setigerous segment is rudimentary with two long cirri on each foot, following this a (dorsal) cirri on each side and two small anal cirri (fig. 4c).

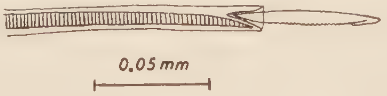

Fig. 6. Dorsal homogomph falcigerous seta.

In the literature I have found only one eyeless species of *Nereis*, *Nereis typhla* MONRO from the Discovery Investigations off South Georgia (MONRO 1930). This species is closely related to *N.eugeniae*. In *N. profundi* the arrangement of the paragnaths is quite different from the arrangement in these species, and, moreover, I cannot find any described species with a similar number of paragnaths arranged in the same way.

It must be a new species unrelated to any known species with normal eyes. Future investigations of the more shallow waters in the area may show relatives.

The specimens were found in a Pandanus fruit in the small tunnels of a boring lamellibranch.

Distribution: Banda Trench 7250-7290 m.

FAM. NEPHTHYDIDAE

Nephthys elamellata ELIASON 1951

(Fig. 7, ELIASON 1951 fig. 2)

Nephthys elamellata ELIASON 1951 p. 133.

Material:

Kermadec Trench: St. 650, 6620 m, 1 spec., 30 set. segm., 32×7 mm, post.segm. lost. St. 651, 6960-7000 m, 2 spec. and 2 fragm., 1.45×4 mm, 2.32×5 mm-33 set. segm., post. segm. lost. St. 653, 6140-6160 m, 2 spec. and 2 fragm., 1.42×4 mm, 2. 11 set. segm. post. segm. lost. St. 658, 6660-6720 m, 5 spec. and 2 fragm., 1.46×5 mm, 2.34×4 mm, 3.44×5 mm, 4.15×5 mm-13 set. segm., post. segm. lost, 5.10×4 mm-16 set. segm., post. segm. lost.

54 setigerous segments. Prostomium trapezoid, the anterior edge broadest, with four short tentacles. No eyes. The proboscis has 14 rows of papillæ. The first segment with a short ventral cirrus, similar to the tentacles, and a very small dorsal cirrus. On the following segments the dorsal cirri are short, rounded, on the caudal side of the branchiæ. The ventral cirri longer than the dorsal, pyriform. In the present specimens the first branchia appears on the 13th to 16th setigerous segments, in Eliason's specimens the first traces of branchiæ are visible on the 13th or the 11th setigerous segment. The anterior branchiæ are very small, posteriorly they attain their full size and are generally coiled inward. The chætal lobes are long and pointed. The anterior lamellæ are rudimentary, the posterior very small. The acicula ends

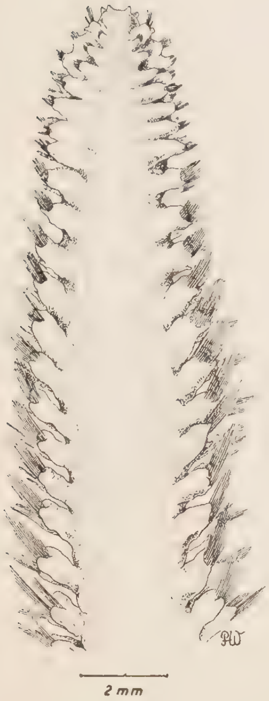

Fig. 7. *Nephthys elamellata* Eliason. Anterior part.

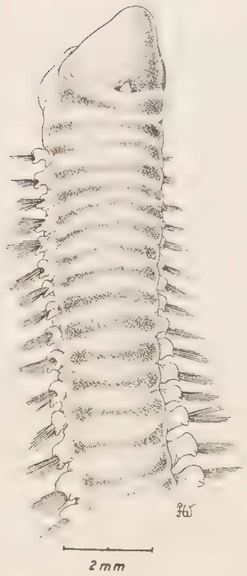

Fig. 8. *Ninoë fusca* Moore. Anterior part.

in a long curved point. Setæ long and yellow, of the usual Nephthys-shape, no lyriform setæ.

Although these specimens were found many miles away from the first finds, I feel sure that it must be the same species. The feet of the present specimens are quite like Eliason's figures.

Distribution: Azores 4255-4267 m, Canary Islands 4540-4600 m, Kermadec Trench 6140-7000 m.

FAM. EUNICIDAE
SUBFAM. LUMBRICONEREINAE

Ninoë fusca Moore 1911
(Fig. 8, Moore 1911 figs. 110-118)

Ninoë fusca Moore 1911 p. 285

Material:

Kermadec Trench: St. 650, 6620 m, 1 spec. and 4 fragm., 10×3 mm-11 set. segm., post. segm. lost. St. 651, 6960-7000 m, 1 spec. and 2 fragm., 26×4 mm-31 set. segm., post segm. lost. St. 658, 6660-6720 m, 16 spec. and 15 fragm., largest: 72×5 mm-71 set. segm., post. segm. lost.

Prostomium an equilateral triangle with rounded apex. The dorsal part of the prostomium with two long grooves from the apex to the nuchal fold. The prostomium is attached to the peristomium by a pair of folds, separated medially by a deep nuchal pit, covered by a nuchal fold of the peristomium. When this is drawn back, the posterior face of the pit is seen to bear a vertical groove lodging a small and apparently retractile papilla. First segment without setæ. The parapodia are uniramous. The anterior very small, after the 15th segment larger. They are short, thick and subcylindrical. The postsetal lip is produced into a small, erect finger-shaped cirrus. 3-4 acicula, black and stout. Setæ disposed in a supra-acicular and a sub-acicular fascicle. All are dark brown at the base, colourless distally. Anteriorly only long bilimbate, capillary setæ occur. The supra-acicular are longer than the sub-acicular. On the posterior parapodia they become shorter. About the 70th segment the hooks appear. They are stout, ending in a small head with small teeth. Mandibles white with dark lines, maxillæ dark brown. Maxillæ II each with only two large teeth. Maxillæ III each with one tooth. Maxillæ IV, large, triangular, each with a single stout tooth. Colour brown.

Distrubution: Santa Catalina Islands (Southern California) 4063 m, Kermadec Trench 6620-7000 m.

FAM. CIRRATULIDAE

Tharyx multifilis Moore 1909
(Moore 1909 plate IX fig. 43)

Tharyx multifilis Moore 1909 p. 267
Tharyx multifilis Moore 1923 p. 187
Tharyx multifilis Fauvel 1932 p. 179
Tharyx multifilis Wesenberg-Lund 1949 p. 332
Tharyx multifilis Berkeley 1952 p. 34

Material:

Banda Trench: St. 499, 6580 m, 3 spec., 20 mm, female with eggs, post. segm. lost, 11 mm, post. segm. lost, 10 mm, post. segm. lost. 1 fragm., 10 mm.

Prostomium a short cone, no eyes. Peristomium apodous and about twice as wide and long as the prostomium, with two partial furrows. Tentacles and branch on the first setigerous segment, in the present specimens only the base of the tentacles left, but they appear to be stouter than the branchiæ. The branchiæ arise in contact with the dorsal side of the notopodium. In the present specimens, which all have lost their posterior segments, the branchiæ occur on every segment. Setæ simple, colourless, smooth, slender capillaries, situated in small notopodial and neuropodial tubercles. The notopodial setæ are longer than the neuropodial, otherwise they are all alike.

This species must be very close to *Th. gracilis* Moore and *Th. marioni* (Saint-Joseph), as there are only very small differences between them.

Distribution: San Diego, Point Pinos 1-590 m (both California), Madras, Vancouver Islands 70 m, Banda Trench 6580 m, Iranian Gulf and Gulf of Oman 8-110 m.

FAM. CLORAEMIDAE

Ilyphagus bythincola Chamberlin 1919

(Fig. 9, Chamberlin 1919 plate 69 figs. 4-9)

Ilyphagus bythincola Chamberlin 1919 p. 402

Material:

Sunda Trench: St. 462, 6740 m, 1 spec., 10×2 mm.

The surface of the body is densely clothed with hair-like filaments, more or less uniformly arranged, and completely cloaking the body. The setæ of the most anterior somites not specially elongate and not forming a head-cage. The prostomium with two short, stout palps. No tentacles visible. Parapodia biramous, but setigerous papillæ absent. The number of segments is small, not exceeding forty. The setæ are simple, strongly cross-striate, annulated. The dorsal setæ are finer than the ventral ones, with the annuli longer. The ventral setæ coarser, straw-coloured and narrow continously distally, being drawn out in a long, fine, straight tip. The annuli are short and strongly marked. No hairs at the tip, as in *I. hirsutus* Monro.

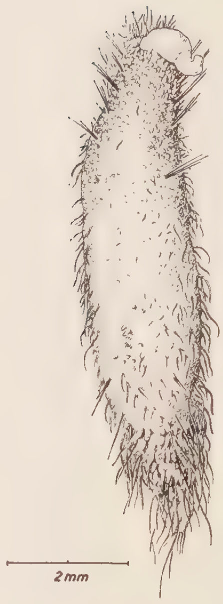

Fig. 9. *Ilyphagus bythincola* Chamberlin.

In 1937 Monro suggests that *I. bythincola, I. pluto* from Peru, *I. ascendens* from Galapagos and his own I. hirsutus from Arabian Sea are the same species, as the differences between them are very small. This new intermediate find seems to show that he is right. *Ilyphagus bythincola* is a true abyssal species.

Distribution: W. Mexico (14°46′N 91°40′W) 3436 m, Sunda Trench 6740 m.

FAM. OPHELIIDAE

Travisia profundi Chamberlin 1919

(Chamberlin 1919 plate 67 figs. 1-4)

Travisia profundi Chamberlin 1919 p. 387
Travisia profundi Uschakov 1955a p. 322

Material:

Banda Trench: St. 495, 7250-7290 m, 1 spec., 28×5 mm. St. 497, 6490-6650 m, 3 spec., 34×5-20×5 mm. St. 499, 6580 m, 1 spec., 32×6 mm.

Body pointed at both ends, broadest anteriorly. Prostomium small, round and smooth. First setigerous segment biannular. All annuli are covered with a transverse row of low, rounded papillæ. The mouth continues as a groove anteriorly. Second setigerous segment biannular too. Third to fourteenth setigerous segments triannulate, 15th is incompletely triannulate, 16th and 17th biannular, and the remaining segments are entire, or uniannular. The branchiæ do not appear until on the third setigerous segment and occur on each one to and including the sixteenth segment. The branchiæ are short anterior, longer posteriorly, but the most caudal ones are also short. Each branchia is subfiliform, gradually narrowing distally, conically acuminate at the tip. They are strongly transversely wrinkled. The setæ occur from the second to the caudal segment. They are pale, capillary, the notopodial longer than the ventral ones. Pygidium short, conicocylindrical, by longitudinal sulci divided into ten lobes.

The present specimens have 27 setigerous segments and the branchiæ occur to and including the sixteenth, while Chamberlin indicates 26 setigerous segments and branchiæ to the fourteenth. Since the annulation and the shape of the branchiæ agree so well with Chamberlin's description, I see no use of erecting a new species on account of the number of segments. Moreover, another new record of this species from the Atlantic at 975 m shows 26 setigerous segments and branchiæ to the fourteenth. Apart from the differences in number of setigerous segments and branchiæ the specimens are quite similar.

Distribution: Off Peru (5°42'S 83°W) 4064 m, off Angola 975 m, Banda Trench 6490-7290 m., Bering Sea 4000 m.

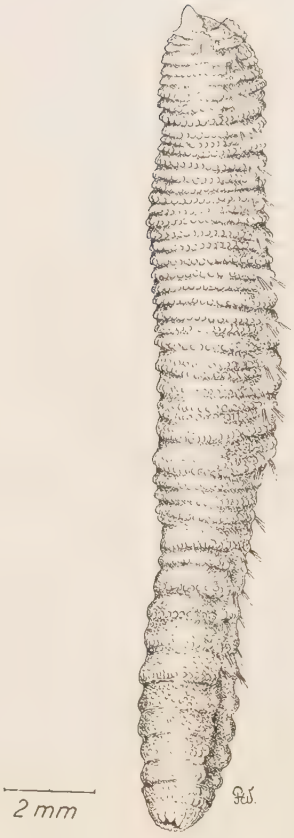

Fig. 10.
Kesun abyssorum Monro.

Kesun abyssorum Monro 1930
(Fig. 10, Monro 1930 fig. 69 a-c)

Kesun abyssorum Monro 1930 p. 167
Kesun abyssorum Augener 1932 p. 44
Kesun abyssorum Monro 1939 p. 133

Material:

Sunda Trench: St. 462, 6740 m, 1 spec., 8 × 1 mm. Kermadec Trench: St. 649, 8210-8300 m, 5 spec. and 1 fragm., largest: 14 × 3 mm. St. 651, 6960-7000 m, 6 spec., 21 × 3-15 × 3 mm, one has lost the post. 7 segm.

24-25 setigerous segments. A short triangular, smooth prostomium and a triannulate buccal segment. The surface of the body is granular, and each annulus is marked by a row of vesicular papillæ. No branchiæ. In the anterior part of the body the setæ are situated in two small papillæ and above and below are two large papillæ. From the 12th setigerous segment all the papillæ of the middle ring increase in size, so for the last 10 segments the bundles of setæ lie in a deep groove. The terminal segments are uniannulate. The anal cylinder with longitudinal furrows.

This form is very closely allied to *Kesun fusus* Chamberlin, may possibly be the same species, since it only differs in the number of segments. The small specimen from the station south of Java has only 20-21 setigerous segments. This is also the case with a specimen of the same species taken by the »Galathea« off Angola, at 1470 m. As this specimen is also very small, measures only 4 mm, they are surely not outgrown, and this may be the reason for the fewer segments.

Distribution: Antarctic 300-1266 m, off Angola 1470 m, Sunda Trench 6740 m, Kermadec Trench 6960-8300 m.

Ammotrypane galatheae n. sp.
(Fig. 11)

Material:

Banda Trench: St. 495, 7250-7290 m, 6 spec., one has lost the posterior 10 segments, 22-29 × 1 mm. (One of them is the type, preserved in the Zoological Museum of the University, Copenhagen).

30 setigerous segments. The prostomium is long, ending in a globular palpode. No eyes visible. Two big extensile nuchal organs with dark pigmental spots. Parapodia small with two tufts of long capillary setæ and a long cirriform branchia. Branchiæ on all setigerous segments except the first one. The distance between the parapodia is longer in the

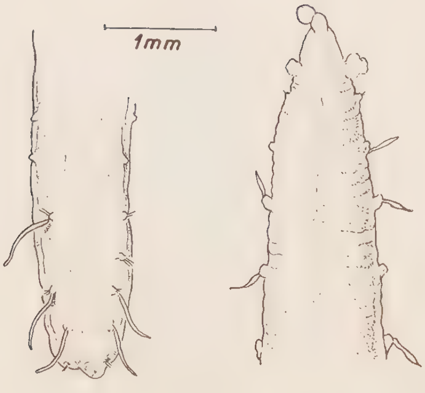

Fig. 11. *Ammotrypane galatheae* n. sp. a. Posterior part, ventral view. b. Anterior part, dorsal view.

middle part of the body than in the anterior and posterior part. The segments 13-14 to 20 with a lateral dark line, possibly the segmental organs. No anal tube. The anus is situated ventrally without any appendages.

A.trigintae HARTMAN 1953 from the coast off Uruguay has 30 setigerous segments, but the number of branchiæ and the structures of the anal process are different.

Distribution: Banda Trench 7250-7290 m.

FAM. CAPITELLIDAE

Notomastus sp.
(Fig. 12)

Material:

Kermadec Trench: St. 649, 8210-8300 m, 5 spec. and 2 fragm.

Thorax of eleven setigerous segments, with only dorsal and ventral capillary setæ. Thorax faintly tessalated, segments biannular. Prostomium large, with a globular tip. Peristomium achætous. Proboscis covered with numerous papillæ. The abdomens of the present specimens are so damaged, that they cannot be determined to species.

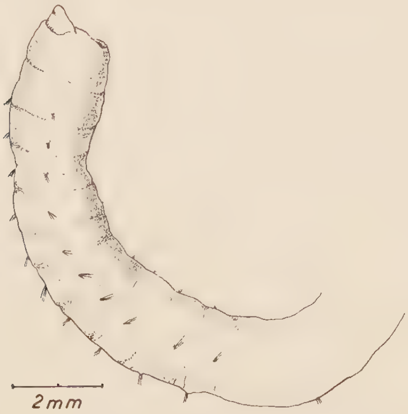

Fig. 12. *Notomastus* sp. Posterior part damaged.

FAM. MALDANIDAE
SUBFAM. EUCLYMENINAE

Maldanella harai (IZUKA) 1902
(FAUVEL 1927 fig. 64 i-n)

Clymene harai IZUKA 1902 p. 111, pl. III figs. 9-12.
Axiothea campanulata MOORE 1903 p. 485, pl. XXVII fig. 99.
Maldanella harai FAUVEL 1914 p. 260, pl. XXIII fig. 1.
Maldanella harai FAUVEL 1927 p. 186.
Maldanella harai FAUVEL 1932 p. 203.
Maldanella harai MESNIL ET FAUVEL 1939 p. 10.
Maldanella harai STÖP-BOWITZ 1948 p. 67.
Maldanella harai USCHAKOV 1950 p. 212.
Maldanella harai USCHAKOV 1955a p. 342.

Material:

Kermadec Trench: St. 650, 6620 m, 1 spec., 7 anterior set. segm., 15×4 mm. St. 658, 6660-6720 m, 48 spec., 3-7 anterior set. segm., 8 fragm. with anal-segm. and 88 fragm. from the middle region, 7 tubes.

Body cylindrical. 2 anteanal segments without setæ. Cephalic plate with a smooth rim faintly notched. Keel and nuchal groove extending on about half the length of the plate. The posterior part of the plate with faintly transversal lines. Prostomium short, round, no eyes. Anterior border of the first 7 setigerous segments with a large rim. Two kinds of dorsal setæ: stout, winged, and slender smooth capillaries. On the first segment only dorsal setæ, uncini on the following, on the second 15 uncini, on the 8th 26. They have one stout tooth and 3 small ones above. Anal funnel elongate, fringed with small equal, triangular cirri. As no specimen is complete the number of segments cannot be counted. According to other finds the number of setigerous segments should be 19.

Furthermore 10 specimens of this species was taken by the »Galathea« off West-Africa at 2690 m.

Distribution: Atlantic Ocean 2690-4700 m, Java 330-1158 m, Bay of Bengal 1154-1462 m, Lakkadive Sea 2110 m, Japan 100-146 m, Kermadec Trench 6620-6720 m, Sea of Okhotsk 220-591 m.

SUBFAM. NICOMACHINAE

? Petaloproctus cirratus Monro 1937
(Monro 1937 fig. 26)

Petaloproctus cirratus Monro 1937 p. 311.
Petaloproctus cirratus Mesnil et Fauvel 1939 p. 10.

Material:

Banda Trench: St. 494, 7280 m, 1 spec., set. segm. 2-5, 22×2 mm. St. 495, 7250-7290 m, 3 spec., 11 set. segm., 26×2 mm, 9 set. segm., 25×2 mm, set. segm. 2-6, 18×2 mm.

Prostomium and peristomium very short, together shorter than the first setigerous segment. The cephalic plate is oblique, rounded in front and with a prominent long keel. Two divergent nuchal organs and several transversal folds. The anterior 7 setigerous segments with a white thick collar in front of the setæ. Dorsal setæ of three kinds: 1, smooth bilimbate capillary setæ, 2, narrowly bordered setæ with barbed tips, 3, long barbed setæ. 4-7 straight ventral hooks with obtuse tips at the first three setigerous segments. The uncini in the following segments with one big tooth and three smaller ones above. Beside the small teeth a number of small denticles. Long subrostral barbules.

As no anal plate is present in the material the specimens cannot be determined with certainty, but the anterior part and the setæ is very similar to the description and figures of *P. cirratus* Monro. Moreover, this species was found in the same area by the Siboga and at great depths in the Indian Ocean.

Distribution: South Arabian Coast 1046 m, Indonesia 36-472 m, Banda Trench 7250-7290 m.

FAM. OWENIIDAE

Myriochele sp.

Material:

Kermadec Trench: St. 649, 8210-8300 m, 30 fragm., 38 tubes. St. 650, 6620 m, 6 tubes. St. 653, 6140-6160 m, 1 fragm. and 1 tube.

Only fragments from the middle part of the body present. Dorsal setæ capillary, with small spines. Ventral parapodia with numerous uncini in several rows. The uncini with a long shaft and two small teeth. Tubes like the tubes of *Myriochele heeri* Malmgren.

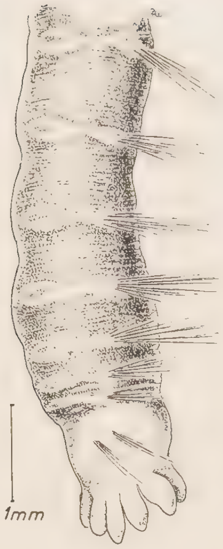

Fig. 13. *Owenia lobopygidiata* Uschakov. Posterior part.

? Owenia lobopygidiata Uschakov 1950
(Fig. 13)

Owenia lobopygidiata Uschakov 1950, p. 214, fig. 31.
Owenia lobopygidiata Uschakov 1955a. p. 347, fig. 128 E-J.

Material:

Banda Trench: St. 497, 6490-6650 m, many fragments and tubes. St. 499, 6580 m, 1 spec., 29 post segm., 5 fragm.

Dark brown, with white parapodia. Dorsal setæ long, capillary, changing colour from red to green and blue. Ventral parapodia like other Oweniidæ-species with numerous, long-shafted uncini with two small teeth, very similar to those of Myriochele heeri Malmgren. 9 short, finger-shaped papillæ in one row round the anus. Tubus with thick sandy walls, dark brown, diameter: 2-4 mm.

Uschakov (1950) describes a new Owenia-species which is distinguished from *Owenia fusiformis* Delle Chiaje by having no eyes. This species has finger-shaped papillæ round the anus and I think it must be the same species as that from the Galathea-Expedition, although the anterior part of this is absent.

Distribution: Banda Trench 6490-6650 m, Sea of Okhotsk 110-1366 m.

FAM. AMPHARETIDAE

Gen. et sp.?

Material:

Kermadec Trench: St. 658, 6660-6720 m, 1 spec., 13×1½ mm, 1 fragm. and 1 tube.

14 thoracic setigerous segments. Uncinigerous pinnules commencing on the 3th setigerous segment. First two feet with a very small tuft of setæ. Palæ absent. Gills absent, but there seems to be three or four pairs in two crowded groups, separated in the middle. 13 abdominal uncinigerous segments. Two anal cirri. Capillary setæ faintly winged, uncini with two rows of teeth, 4-5 teeth in each row.

The anterior part of the only complete specimen is so damaged that a closer determination is impossible.

Gen. et sp. ?

Material:

Sunda Trench: St. 465, 6930-7000 m, 1 fragm. with 11 set. segm.

Only eleven setigerous segments from the thoracic region present. Capillary setæ faintly winged, uncini with one row of 6 long teeth.

FAM. TEREBELLIDAE

SUBFAM. CANEPHORINAE

Terebellides eurystethus CHAMBERLIN 1919

(CHAMBERLIN 1919 plate 80 figs. 7-15)

Terebellides eurystethus CHAMBERLIN 1919 p. 438.

Material:

Kermadec Trench: St. 658, 6660-6720 m, 1 spec., thorax with a few abdominal segm., 14×2 mm.

Thorax with 18 setigerous segments. The prostomium is a prominent lobe which widens anteriorly like the end of a trumpet, the anterior end being broad and flat, with the edge wavy or folded. The branchia has nearly the general form and proportions as in *T. stroemi.* The first notopodia are short and rounded, the others are longer. The pinnulæ of the abdomen are prominent. The capillary setæ begin on the third segment, they are coarser than in *T. stroemi,* and the wing of one side is much wider. On the sixth setigerous segment the usual unidental, acicular ventral setæ. The thoracic uncini on the following 12 segments. They have the long, distally somewhat curved stalk, the fang is scarcely curved, its distal upper edge is convex, its lower one straight. Four or five slender teeth above the fang. The projecting caudal region of the crown is higher and less widely rounded than is usual in *T. stroemi.* The abdominal uncini have the usual short broad base. The crown of smaller teeth usually bends about the base of the large tooth in a series of six or seven teeth.

This species must be very close to *Terebellides stroemi,* maybe they are conspecific. I hope that later investigations on a larger material will clear up the problem.

Distributions: S. of Panama (6°21'N 80°49' W) 1410 m, off Peru (11°55'S 81°20'W) 4750 m, Kermadec Trench 6660-6720 m.

FAM. SABELLIDAE

SUBFAM. FABRICINAE

Jasmineira sp.

Material:

Banda Trench: St. 494, 7280 m, 2 spec., one with branchiæ and 4 set. segm., $4 \times {}^1/_2$ mm, one without branchiæ and 7 set. segm., $3 \times {}^1/_2$ mm, 1 abdominal fragm. with 15 set. segm., $5 \times {}^1/_2$ mm, 2 small fragm. and 3 branchial-crowns, some small tube-fragments.

Kermadec Trench: St. 649, 8210-8300 m, 2 fragm. of one specimen. St. 650, 6620 m, 2 fragm. of one specimen, 2 fragm. of branchiæ, some tubes of fine clay.

The branchial-filaments are free, without an interbranchial membrane. Collar high and dorsally extending backwards as two separate folds. First setigerous segments with dorsal capillary setæ only. The following thoracic segments with two kinds of setæ, some dorsal narrowly lanceolate and some spatulate. Thoracic uncini with a long shaft, one big tooth and many small above. Abdominal capillary setæ very slender, uncini avicular.

The setæ are very similar to the setæ of *Jasmineira elegans* SAINT-JOSEPH from the Atlantic, which, according to MESNIL ET FAUVEL 1939 p. 29, is possibly identic with *J.ecaudata* MOORE 1923 from California and Indonesia.

The present material is in a too poor condition to make a closer determination, but the setæ of the fragments from the Kermadec and Banda Trench are alike.

FAM. SERPULIDAE

Gen. et sp. ?

Material:

Kermadec Trench: St. 650, 6620 m, 1 fragm. of the post. segm., 2 mm long, 5 tubes, largest: 14×1 mm.

Only very few and very small setæ present. Some of them hair-shaped and some are faintly winged with serrated edge. Tubes calcareous of the usual shape, not coiled.

Zoogeographical Summary

Since this paper only forms part of a study of the deep-sea Polychætes, obtained during the cruise of H. M. S. »Galathea« 1950-52, I think it premature to draw further conclusions about the zoogeography. In a later publication dealing with all the Polychætes taken by »Galathea« at depths from 400 to 6000 m I hope that it will be possible to say more about the distribution of Polychætes in the deep-sea.

Although only fifteen determinable species of Polychætes have been dealt with in the present paper some conclusions could nevertheless be drawn now about the Polychæte-fauna at great depths.

Ten of the species seem to be really abyssal, they have until now only been taken at depths at which the temperature is below 4° C (see table 1). Among these are two, *Macellicephala abyssicola* and *Kesun abyssorum,* distributed in all three oceans, they are cosmopolitan species. Of *Nephthys elamellata* and *Travisia profundi* we have records from the Atlantic and the Pacific and of *Ilyphagus bythincola* from the Pacific and the Indian Ocean. I am sure that further investigations will show that these species too have a wide distibution in all three oceans. Maybe this will also be the case with *Ninoë fusca* and *Terebellides eurystethus,* which at the present are only known from the Pacific area.

The remaining three abyssal species, *Macellicephala hadalis, Nereis profundi, and Ammotrypane galatheae,* are all new to science. *M. hadalis* was found in three trenches, but the other two species were taken in the Banda Trench. Is it possible that these three species are representatives of a special trench-fauna? The latest publication by USCHAKOV on the *Aphroditidæ* from the Kurile-Kamtchatka Trench (USCHAKOV 1955b) is in agreement with this theory. Of five species taken at depths greater than 6000 m four are new to science, they are only taken below 6000 m, and only in this trench. The remaining *Macellicephala mirabilis* is a cosmopolitan, eurybathic and eurythermic species.

Five of the fifteen species found in the trenches are eurybathic and eurythermal. These species are *Maldanella harai, Ancistrosyllis constricta, Tharyx multifilis, Petaloproctus cirratus,* and *Owenia lobopygidiata. Maldanella harai* is a thrue cosmopolitan species, distributed all over the world from 36 m in the tropics with high temperatures down to 6720 m in the Kermadec Trench with very low temperatures (1°.3 C). *Tharys multifilis* is found in shallow water at the western coast of N. America and down to 6580 m in the Banda Trench. It is only known from the Pacific and the Indian Ocean, but a very closely connected species, *Th. marioni* (SAINT-JOSEF), occurs in the Atlantic. This is also the case with *Ancistrosyllis constricta,* which is found at high temperatures at the eastern coast of India and down to 6580 m in the Banda Trench. *A. constricta* has a nearly related form in the Atlantic, *A. robusta Ehlers.* It is interesting to read in Southerns description from Chilka Lake (Southern 1921, p. 571) that *Ancistrosyllis constricta* of all the Polychætes in the lake was the species, »which can endure the greatest range of conditions.«

To summarize, it seems to me at present that the deep-sea Polychæte-fauna consists of three elements:

1. Eurybathic and eurythermic species, many of them, maybe all, cosmopolitan.
2. Eurybathic and stenothermic species with a world-wide distribution, living at temperatures below c. 4°C.
3. Stenobathic and stenothermic species, a special hadal fauna.

List of Polychaetes from depths greater than 6000 m

Species	Records beyond 6000 m				Other records					
	Depth in m	Bottom Temp. °C	Ocean	Locality	Depth in m	Bottom Temp. °C	Ocean	Locality	Author	No. of records
Aphroditidæ										
Macellicephala abyssicola Fauvel	6620–7000	1.3	Pac.	Kermadec Trench	4380	2.8	Atl.	Bay of Biscay	Fauvel 1914:41	1
– – –	7250–7290	3.6	–	Banda Trench	4255–4872	2.4	–	S. of the Canaries	Eliason 1951:132	2
– –	7130–7160	1.5	Ind.	Sunda Trench						
Macellicephala hadalis n.sp.	6660–8300	1.3–1.6	Pac.	Kermadec Trench						
– – –	10160–10210	2.6	–	Philippine Trench						
– – –	7250–7290	3.6	–	Banda Trench						
Macellicephala sp. (Eliason 1951)	7630–7900	?	Atl.	N. of Puerto Rico						
Macellicephala mirabilis McIntosh	7210–7320	?	Pac.	Kurile-Kamtch. Trench	1260	4	Pac.	N. of New Zealand	McIntosh 1885:121	1
– –					90	?	Atl.	Kara Sea	Levinsen 1887:4	1
– – –					900	?	–	S. of Africa	McIntosh 1904:59	1
– –					200–300	?	–	E. of Greenl.	Wiren 1907:287	1
– –					1095	7	–	Off Azores	Fauvel 1914:39	1
– – –					13	?	–	South Georgia	Augener 1932:102	1
– – –					155–178	?	–	– –	Monro 1936:100	1
– – –					733	1	–	W. of Greenl.	Ditlevsen 1937:15	1
– – –					699–1090	÷0.5	–	NE of Iceland	Wesenberg-Lund 1950:9	2
– – –					1366	?	Pac.	Sea of Okhotsk	Uschakov 1950:156	1
Macellicephala zenkevitchi Uschakov	8100	?	Pac.	Kurile-Kamtch. Trench						
Macellicephaloides grandicirra Usch.	8100–9950	?	–	Kurile-Kamtch. Trench						
Macellicephaloides verrucosa Usch.	7210–7230	?	–	Kurile-Kamtch. Trench						
Macellicephaloides vitiazi Usch.	7210–8430	?	–	Kurile-Kamtch. Trench						
Phyllodocidæ										
Vitiazia dogieli Uschakov	8100	?	–	Kurile-Kamtch. Trench						
Hesionidæ										
Ancistrosyllis constricta Southern	6580	3.5	–	Banda Trench	Shallow	?	Ind.	Bay of Bengal	Southern 1921:573	1
– – –					water	?	–	–	Fauvel 1932:64	1
Nereidæ										
Nereis profundi n.sp.	7250–7290	3.6	–	Banda Trench						
Nephtydidæ										
Nephthys elamellata Eliason	6140–7000	1.2–1.3	–	Kermadec Trench	4255–4600	2.4	Atl.	W. of Azores- W. of Canaries	Eliason 1951:133	2
Eunicidæ										
Ninoë fusca Moore	6620–7000	1.3	–	Kermadec Trench	4060	1.7	Pac.	Off California	Moore 1911:285	1
Lumbriconereis sp. (Uschakov 1952)	8100	?	–	Kurile-Kamtch. Trench						
Cirratulidæ										
Tharyx multifilis Moore	6580	3.5	–	Banda Trench	1–590	?–6	Pac.	Off California	Moore 1909:267, 1923:187	2
– – –					?	?	Ind.	Off Madras	Fauvel 1932:179	1
– – –					8–110	18–24	–	Iranian Gulf	Wesenberg-Lund 1949:332	2
– – –					70	?	Pac.	Off Vancouver	Berkeley 1952:34	1

Cloræmidæ										
Ilyphagus bythincola Chamberlin	6740	1.5	Ind.	Sunda Trench	3436	1.8	Pac.	Off W. Mexico	Chamberlin 1919:402	1
Opheliidæ										
Travisia profundi Chamberlin	6490–7290	3.5–3.6	Pac.	Banda Trench	4064	1.9	Pac.	Off Peru	Chamberlin 1919:387	1
– – –					4000	?	–	Bering Sea	Uschakov 1955a:322	1
– – –					975	4.2	Atl.	Off Angola	Kirkegaard (unpubl.)	1
Kesun abyssorum Monro	6960–8300	1.3–1.6	–	Kermadec Trench	1080	÷1.3	–	Antarctic	Monro 1930:167	1
– – –	6740	1.5	Ind.	Sunda Trench	750	?	–	–	Augener 1932:44	1
– – –					300–1266	?	Ind.	–	Monro 1939:133	2
– – –					1470	3.8	Atl.	Off Angola	Kirkegaard (unpubl.)	1
Ammotrypane galatheæ n.sp.	7250–7290	3.6	Pac.	Banda Trench						
Capitellidæ										
Notomastus sp.	8210–8300	1.6	–	Kermadec Trench						
Maldanidæ										
Maldanella harai (Izuka)	6620–6720	1.3	–	Kermadec Trench	146	c.15	Pac.	South of Japan	Izuka 1902:111	1
– – –					100–119	?	–	– – –	Moore 1903:485	1
– – –					4380	2.8	Atl.	Bay of Biscay	Fauvel 1914:260	1
– – –					1154–2110	? 2.2	Ind.	Bay of Bengal	– 1932:203	2
– – –					330–1158	c.9–?	Pac.	Indonesia	Mesnil et Fauvrl 1939:10	2
– – –					4700	2.1	Atl.	Bay of Biscay	Støp-Bowitz 1948:67	1
– – –					220–591	?	Pac.	Sea of Okhotsk	Uschakov 1950:212	3
– – –					2690	2.6	Atl.	Off Angola	Kirkegaard (unpubl.)	1
Petaloproctus cirratus Monro	7250–7290	3.6	Pac.	Banda Trench	1046	c.9	Ind.	South Arabia	Monro 1937:311	1
– – –					36–472	?–c.9	Pac.	N. of Celebes	Mesnil et Fauvel 1939:10	2
Oweniidæ										
Myriochele sp.	6140–8300	1.2–1.6	Pac.	Kermadec Trench						
Owenia lobopygidiata Uschakov	6490–6650	3.5	–	Banda Trench	110–1366	?	Pac.	Sea of Okhotsk	Uschakov 1950:214	1
Ampharetidæ										
Amphicteis mederi Annenkova	8100	?	Pac.	Kurile-Kamtch. Trench	88–1366	?	Pac.	Sea of Okhotsk	Uschakov 1950:221	1
Gen. ? sp. ? I	6660–6720	1.3	Pac.	Kermadec Trench						
Gen. ? sp. ? II	6930–7000	1.5	Ind.	Sunda Trench						
Terebellidæ										
Terebellides eurystethus Chamberlin	6660–6720	1.3	Pac.	Kermadec Trench	1410	3.3	Pac.	S. of Panama	Chamberlin 1919:438	1
– – –					4750	1.7	–	Off Peru	– 1919:438	1
Sabellidæ										
Jasmineira sp.	6620–8300	1.3–1.6	Pac.	Kermadec Trench						
– –	7280	3.6	–	Banda Trench						
Potamilla sp. (Uschakov 1952)	8100	?	–	Kurile-Kamtch. Trench						
Serpulidæ										
Gen. ? sp. ?	6620	1.3	Pac.	Kermadec Trench						

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POGONOPHORA

Galathealinum bruuni n. gen. n. sp., a new representative of the class.

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INTRODUCTION

The class *Pogonophora* was erected by JOHANSSON in 1937 based upon a closer investigation on the species *Lamellisabella zachsi* USCHAKOV 1933. USCHAKOV described L. *zachsi* as a Polychaete belonging to a new subfamily of the family *Sabellidae*. By anatomical studies of USCHAKOV'S species JOHANSSON showed that it could not be a *Sabellid* and even not a Polychaete. In a later publication JOHANSSON (1939) regarded it as a representative of a new class of the Oligomera.

Lamellisabella zachsi was found in the Sea of Okhotsk at a depth of 3500 m. Later IVANOV (1949) described a new species of the same genera L. *gorbunovi* from the Polar Sea at 3700 m, and in 1951 the same author referred *Siboglinum weberi*, taken at depths from 462 to 2060 m by Siboga in the Malaya Archipelago and described by CAULLERY in 1914, to the same class.

Until then only very few specimens of the class were known, so the knowledge of the morphology and anatomy was very incomplete, but the recent Soviet expeditions to the northwestern part of the Pacific collected a very extensive material of *Pogonophora*, in one haul at 8840 m they obtained 2000 specimens of two new species, so after the description of the external morphology by IVANOV 1952, translated into English by PETRUNKEVITCH 1954, and the anatomy by IVANOV 1955a, we have now a complete picture of the structure of this interesting group.

The *Pogonophora* is a very homogenous group. All the species have a very long, cylindrical body (see PETRUNKEVITCH 1954 fig. 1). It consists of a short anterior section, in front of which there is a well-developed tentacle-apparatus, and a very long trunk.

The anterior section is drawn out into a cephalic lobe dorsal to the base of the tentacles. The tentacles are long and bear rows of small pinnules. On the ventral surface of the anterior section there is always a pair of oblique cuticular ribs, called the bridle, they attenuate as they pass forward towards the lateral surface and then onto its dorsal surface. Between the anterior section of the body and the trunk is an external ringshaped constriction and an internal muscular diaphragma.

The trunk is divided into two main sections, the preannular and the postannular section, by two belts of chitinous platelets.

The preannular section has a wide ventral groove which gradually becomes obliterated towards the posterior end of the section. This groove is bordered by small folds with rows of adhesive papillae in which, except in *Siboglinum*, small chitinized platelets are situated. Anteriorly these organs of attachment are arranged in a secondary metamerism, but further back the adhesive papillae become scattered irregularly on the ventral side of the body. According to this we can distinguish a short metameric portion and a very long non-metameric portion in the preannular region. On the dorsal side of the metameric region there is a broad, ciliated band.

The postannular section of the trunk also bears small, adhesive papillae with chitinoid platelets, again arranged metamerically in transverse ventral rows. No oral or anal openings are found in any specimen of *Pogonophora*. They live in tubes which consist of a chitin-like organic substance. These tubes never branch and have a lamellated structure. They are secreted by numerous glands in the body wall.

The anterior section of the body consists of two segments (see IVANOV 1955a fig. 1). The first segment is represented by an unpaired coelomic sac which opens laterally through a pair of coelomoducts. In the tentacles are coelomic canals which open in this anterior unpaired coelomic sac. The tentacle-apparatus is thus the first segment. To this segment belongs also the dorsal cephalic lobe. The greater part of the anterior section of the body consists of the second segment. Its paired coelom sacs are without coelomoducts. In this part of the body are many multicellular glands. The trunk constitutes the third segment. It contains a pair of coelomic sacs in which the gonads are situated. The coelomoducts of this section are used as gonoducts.

The body is covered with a one-layer epithelium rich in unicellular glands and with a cuticle. The nervous system is very primitive, histologically resembling that of the *Enteropneusta*. It is situated in close connection with the epithelium. In the cephalic lobe there are many ganglion cells, and from this brain issues a longitudinal dorsal nerve-cord and lateral nerves to the tentacles.

The vascular system is represented by a ventral and a dorsal longitudinal vessel. In the ventral vessel the blood is running forward to the heart situated at the base of the tentacles. From here the blood is pumped into the tentacles from where it goes to the dorsal vessel where it runs backward to the posterior end of the body. In the females there are longitudinal vessels along the ovaries. There are several lateral connections between the dorsal and ventral vessels in the posterior part of the body. At the anterior end of the dorsal vessel are three blind-ending branches which convey blood to the brain. In one group of Pogonophora there is a pericardion lying dorsally to the heart.

The coelomoducts of the first segment are the excretory organs. They are ciliated and lying close to the blind-ending branches of the dorsal blood-vessel.

The *Pogonophora* have separate sex. There is only one pair of gonads situated in the trunk, separated from the coeloms by their own walls. In the males the testes fill up the whole posterior part of the trunk. The sperm ducts are very long canals which occupy a considerable portion of the preannular region; they are usually filled up with characteristic spermatophores. They open on the border between the anterior section of the body and the trunk upon a pair of genital papillae. The ovaries occupy the anterior part of the trunk and have very short oviducts which open in the middle of the trunk. The eggs are very big with much yolk. The larval development is unknown.

There is no digestive canal and no anal or oral opening.

The *Pogonophora* live a sedentary life at very great depths. The finds are from 462 m in the Malaya Archipelago and down to about 10.000 m in the Kurile-Kamtchatka Trench. They live in a cylindrical tube which sticks out of the bottom with its open end upward and they never leave the tube. In some places they are extremely numerous. They seem to have an extra oral digestion. IVANOV (1955b) showed that the structure of the tentacle-apparatus reminds of a digestive canal. The animals always keep the tentacles close together, forming a cylinder with an opening at the upper end and openings between the bases of the tentacles. At the edge of the tentacles are cilia which form longitudinal ciliated bands. By means of the ciliated bands the water streams through the tentacle-cylinder and brings with it the plankton or détritus. When the tentacles are filled up with food the animals may withdraw to their tubes and begin to digest. Several glands at the edge of the tentacles seem to function as digestive glands and the long bloodfilled pinnules remind so much of the villi in a mammalian intestine that it may have the same function. Besides, the tentacle-apparatus undoubtedly performs a respiratory function. The need of food must be great since the *Pogonophora* have a big production of sperm and eggs and the eggs are very rich in yolk. According to IVANOV (1955b) the growth continues even in the adult animals.

In the latest publication by IVANOV (1955c) he is of the opinion that the class *Pogonophora* should be placed in the neighbourhood of the *Enteropneusta*. Several characters are common. Nevertheless there are other characters which separate the *Pogonophora* from the Hemichorda, so IVANOV prefers to regard the group as a special type of Deuterostomia and erect a new phylum *Brachiata*. The phylum *Brachiata* has one class Pogonophora JOHANSSON 1937.

The class *Pogonophora* can be separated into two orders:

1. *Athecanephria* IVANOV 1955: First coelom formed as a sac. The coelomoducts of the first segment are placed far from each other and lying close to the *lateral* blind-ending branches of the anterior part of the dorsal blood-vessel. The heart with a pericardion. 1 family: *Siboglinidae*.

2. *Thecanephria* IVANOV 1955: First coelom formed as a horse-shoe. The coelomoducts of the first segment are closer together medially and lying close to the *medial* blind-ending branch of the anterior part of the dorsal blood-vessel. No pericardion.

3 families: *Polybrachiidae, Lamellisabellidae, Spirobrachiidae*.

As to the definition of the families and the previously described species see PETRUNKEVITCH 1954.

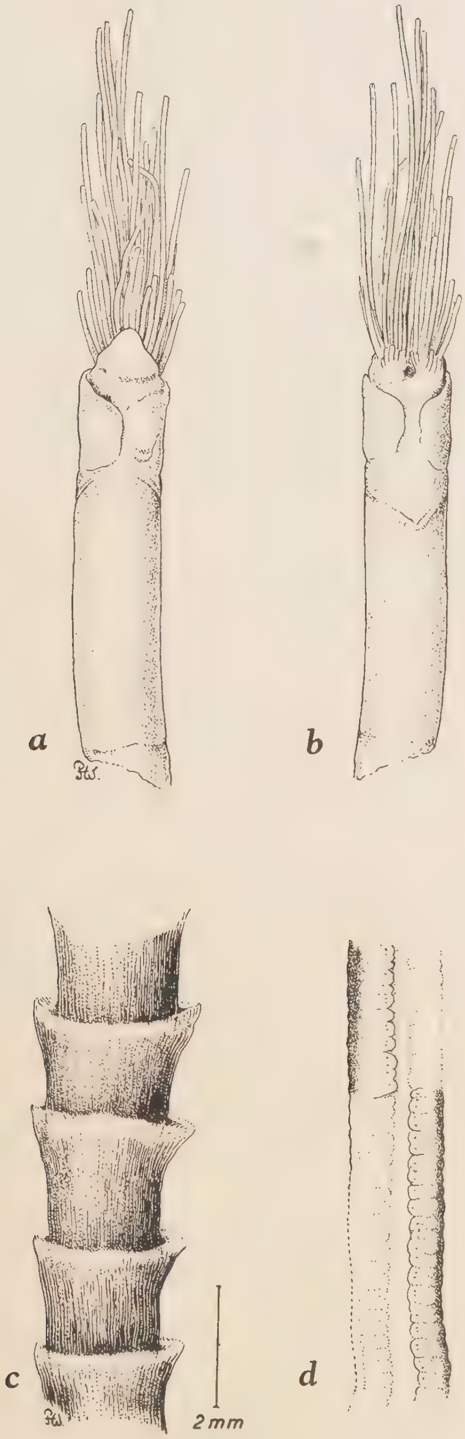

Fig. 1. a-b. Anterior section of *Galathealinum bruuni* n. gen. n. sp. a. Dorsal view. b. Ventral view. c. Part of tube. d. Part of trunk, ventral view.

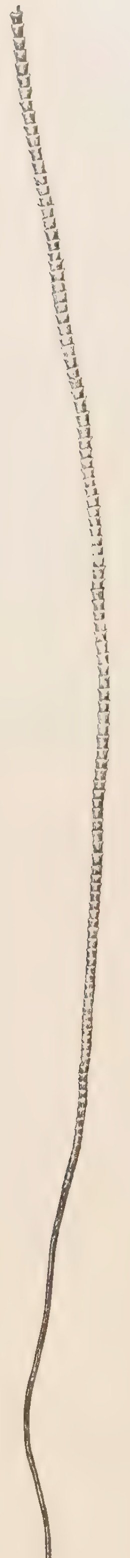

Fig. 2. Tube of *Galathealinum bruuni* n. gen. n. sp.

So far 8 species have been described, but Ivanov writes in one of his latest publications (1955a) that the material from the great Soviet Expedition in the northwestern part of the Pacific includes 12 species belonging to 8 genera and 4 families.

The material from the »Galathea«-Expedition contains one species of *Pogonophora,* which is different from any of the described species and genera.

The figures in this publication were made by Poul H. Winther, the scientific drawer, and the English text was corrected by Mrs. A. Volsøe to both of whom I express my best thanks.

Description of the material

FAM. POLYBRACHIIDAE Ivanov 1952

Pogonophora with numerous free tentacles arranged in a circle or on a horseshoe-shaped base.

Galathealinum bruuni n. gen. n. sp.

Figs. 1 and 2.

Material:

Celebes Sea: St. 450. 1°50′N 119°30′E. 5090-5110 m. 1 specimen, anterior section with a piece of the anterior part of the trunk. Most of the tentacles lost. Anterior section: 7×1 mm. (Type). 1 tentacle-crown. 9 tubes, largest one 370 mm long, possibly broken. (Type in the Zoological Museum of the University, Copenhagen).

Numerous long, free tentacles. On the free tentacle-crown I can count 105 tentacles, but some were possibly lost. The tentacles are attached to a horseshoe-shaped base. Anterior section of the body in front of the bridle with a deep dorsal transverse groove which separates the cephalic lobe from the body. On the ventral side, anteriorly to the bridle, are two wings or folds, separated ventrally, which continue laterally where the edge is parallel to the bridle. They are fused dorsally. The combs of the bridle do not merge ventrally. Adhesive platelets on the anterior part of the thrunk oval, the longest diameter 40μ. A sickle-shaped thickening of their anterior edge.

The tubes are thin and massive at the base, 0.8 mm in diameter, but become longer and cylindrical in the upper part where they have a diameter of 2 mm. They remind of the tubes of *Polybrachia annulata,* but the distance between the collars are shorter.

The only specimen at hand is in a poor condition, because it was preserved in the tube. The *Pogonophora* have a very strong longitudinal musculature which makes the animals contract strongly during fixation. This makes it very difficult to extract the animals from the stiff and hard tube. Nevertheless, the most important characters are visible, and they show that the specimens represent a new genus. The numerous free tentacles arranged on a horseshoe-shaped base place the species in the family *Polybrachiidae.* It reminds of the genus *Polybrachia,* but it has no rings in front of the bridle. Instead of this there is a deep fold starting with two wings on the ventral side of the body. This character is not present in the earlier described species and refers it to a new genus.

Distribution: Celebes Sea 5090-5110 m.

Zoogeographical Remarks

Species of the class *Pogonophora* are known only from the Malaya Archipelago, the north western Pacific, and one single find in the Polar Sea. Apart from *Siboglinum weberi,* which was taken at 462 m, all the other species are from depths greater than 3000 m. So they seem to live at great depths only and this may be the reason why they have only been found in so few places. They may have a wider distribution, but may have been overlooked. On the other hand, the tubes are long and very characteristic, and in places where the *Pogonophora* live they are extremely numerous. At least it seems almost incredible that they should have been overlooked in the Atlantic which is so well explored even at great depths.

Ivanov (1955b) writes that the food requirements of these animals must be very great, since the production of sperm and eggs is so considerable and the growth continues throughout their life time. We know now that the supply of organic matter is great in the north western part of the Pacific and the Malaya Archipelago, so it seem reasonable to me that Pogonophora is restricted to areas where the organic production is high. The ability to spred to other areas rich in food seems to be rather limited. They are exclusively sedentary, they never leave the tube, and the big eggs rich in yolk are indicative of a non-pelagic or at least a very short pelagic larval life.

According to this the Pogonophora seem to be a very specialized deep-sea group from areas in the western Pacific with a great supply of organic matter.

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ISOPODA
FROM DEPTHS EXCEEDING 6000 METERS

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* Collected by the Galathea Expedition.

A. INTRODUCTION

The Galathea Expedition investigated five deep-sea trenches with depths greater than 6000 m. In three of these, the Philippine, the Banda, and the Kermadec Trenches Isopoda were collected. The present contribution deals only with the Isopoda from depths exceeding 6000 m, and is the first part of a treatment of all the deep-sea Isopoda of the Galathea Expedition.

Until recently the deepest recorded isopods were *Storthyngura intermedia* (BEDDARD 1886, p. 69) from 5010 m, *Antarcturus abyssicola* (l. c., p. 99) from 4360 m and *Ilyarachna abyssorum* (RICHARDSON 1911, p. 17) from 4060 and 4165 m, being at the same time the only Isopoda known from depths greater than 4000 m. Some months ago NORDENSTAM's work on a new species of *Bathyopsurus (B. nybelini)* from the Swedish Deep-Sea Expedition was published. This species was caught at three stations in the Central Atlantic at the following depths: 5500-5987, 5850-5860, and 7625-7900 m. Moreover, in 1949 and 1953, the Russian Oceanologic Institute Pacific Expedition on board the Vitjaz investigated the Kuril-Kamtchatka Trench north of Japan. Apart from a few papers on the bottom fauna and some on pelagic forms only preliminary results have been published so far (ZENKEVITCH, BIRSTEIN & BELJAEV 1954, and ZENKEVITCH 1954). According to the former paper Isopoda have been caught at depths down to 8400 m.

In the present work on the Isopoda from the greatest depths no less than twelve different species are treated. According to the papers of the present Galathea Report, hitherto published on the trench fauna (or in preparation), this number of species is only surpassed by the Polychaetes which comprise 18 species, and the Holothurians and Amphipoda of which there are 13 species from depths greater than 6000 m (KIRKEGAARD 1956, B. HANSEN 1956 and E. DAHL (in press)). However, the collection of specimens of Isopoda in most cases numbers only a single or a few of each species. Most of the material is fairly well preserved considering the rough handling during the several hours' hauling of the trawl. When dredging a robust bucket was attached to the cod-end of the trawl and often several litres of material (clay, ooze, etc.) from the ocean floor was retained in the bucket, thus serving to protect the often extremely fragile bottom-living crustaceans and other invertebrates.

Only two of the six marine sub-orders of Isopoda are represented in the material: the Asellota account for eleven species, and the Anthuridea for one only. All species seem to belong to known genera, but the following had to be described as new species: *Ischnomesus bruuni, I. spärcki, Macrostylis galatheae, M. hadalis, Storthyngura benti, S. furcata, Eurycope madseni, E. galatheae,* and *Leptanthura hendili.*

During the investigation a great many related species were examined. The majority of them were kept in the rich collections of this Museum, but several had to be borrowed from foreign institutions. I take the opportunity of thanking the following colleagues for placing this material at my disposal: Dr. I. GORDON (London), Dr. J.-G. HELMCKE and Dr. H.-E. GRUNER (Berlin), Mr. N. KNABEN (Oslo) and Professor K. LANG (Stockholm). In order to be able to undertake a satisfying comparison several of these species (especially those from the Challenger and the German Antarctic Expeditions) had to be redescribed and even revised; I found it most appropriate to include this part of the investigation in the present contribution, which also contains the diagnosis of a new genus, *Stylomesus,* and the description of a new species, *Eurycope gaussi* which it was found necessary to establish on the material borrowed from the German Antarctic Expedition.

The bottom-temperatures given are according to BRUUN & KIILERICH (1955). In most cases the Expedition obtained records of temperatures for depths exactly corresponding to those from which the bottom-living isopods were dredged. Sometimes no temperature records were available from just the depth at which the animals were caught; in such cases the average figures and graphically interpolated figures recorded in BRUUN & KIILERICH's paper have been used.

The salinity has not been stated for each species, since it is practically constant everywhere in the abyssal zone. In the trenches it was found to be 34.7 ‰ ± 0.2 ‰.

The illustrations were drawn by the author, except figs. 5, 13, 25, 29, and 43 a which were drawn by the artist POUL H. WINTHER. The English text was revised by Mrs. AGNETE VOLSØE.

All type specimens are kept in the Zoological Museum of the University, Copenhagen.

Finally, I wish to express my gratitude to Dr. A. F. BRUUN, the leader of the Galathea Expedition, for help and inspiration during the preparation of the present work.

B. SYSTEMATIC PART

1. Asellota

PARASELLIDAE

The systematic position of the great number of genera within this family has not yet been finally decided. In his great work on the Isopoda from the Ingolf Expedition HANSEN (1916) divided this family into 12 groups without daring to give them a definite systematic value. NORDENSTAM (1933) added one more group and several sub-groups, while GURJANOVA (1933) united several groups into altogether 9 families without giving any arguments for this classification. NIERSTRASZ (1941) followed HANSEN's original division which has also been maintained in the present paper.

Ischnomesini Hansen

The Ischnomesini form a very characteristic group within the Asellota and can at once be recognized by the backwards produced fourth pereion somite and the forewards produced fifth somite which is always very long.

The two present species agree with all the group characters given by HANSEN (1916, p. 54). The only exceptions are presence of a mandibular palp in *Ischnomesus bruuni* n. sp. and relative length of the pereiopods in this species and in *I. spärcki* n. sp. According to HANSEN pereiopods IV and V are »subequal in length and conspicuously longer than the second and seventh pairs.« HANSEN united altogether 21 species within the Ischnomesini, but only in six of these are the pereiopods known and described or figured. Apparently HANSEN was not aware that prior to his paper VANHÖFFEN had described another Ischnomesin which is also complete and has shorter pereiopods II and VII. Since then only one more species has been reported (by BARNARD), but the only specimen available was incomplete and lacked the greater part of the appendages. In all the seven complete species pereiopods II and VII are shorter than IV and V. However, in one of the present new species, *I. bruuni*, pereiopods III-VII which are all preserved are exactly equally long. Only basis of II is present, and it is definitely shorter than basis of all the following pereiopods and thus in agreement with the group character. In the other new species, *I. spärcki*, basis is again the only segment present in most of the pereiopods. It is nevertheless evident that pereiopod VII is as long as III, IV and VI, while II (and V) are somewhat shorter. Furthermore, Dr. GORDON, on my request, has studied the type specimen of *I. bacillus* Beddard, kept in the British Museum (Nat. Hist.). The specimen is a fragment, existing of somites 5-7 and pleon only. Even if it has been mounted on a slide and the appendages are bunched together, Dr. GORDON is able to state that pereiopods IV-VII seem to be of nearly equal lenth, the only difference being that dactylus seems to increase progressively from IV to VII.

Therefore, absence of mandibular palp and relative length of pereiopod VII cannot be maintained as group characters. On the other hand, pereiopod II is, in all known cases, shorter than at any rate some of the succeeding pereiopods.

In 1908 (p. 81) RICHARDSON replaced the invalid generic name *Ischnosoma* G. O. Sars 1866 by *Ischnomesus*, and at the same time she established three new genera, *Haplomesus, Heteromesus*, and *Rhabdomesus*. The latter and *Ischnomesus* agreed in having two segments in the uropods and the third segment of antenna 2 less than twice as long as the fourth. The reasons for separating *Ischnomesus* and *Rhabdomesus* were according to RICHARDSON: 1. One pleon somite in the former, two in the latter; 2. The pereion somites 4 and 5 not produced in spines in the former, but with lateral spines in the latter. *Ischnomesus*, being a substitute name for *Ischnosoma*, retained the type species *bispinosus* G. O. Sars (by monotypy). She placed the two imperfect specimens from the Challenger, described by BEDDARD as *Ischnosoma bacillus* and *bacilloides*, in the genus *Rhabdomesus*.

In his paper on the isopods of the German Antarctic Expedition VANHÖFFEN (1914, p. 560) described a new species which, with some doubt, he referred to *Rhabdomesus (R.inermis)*. He stated that it had two segments in the pleon. But at the same time the third segment of antenna 2 was more than twice as long as the fourth, thus differing from RICHARDSON's diagnosis. Since, however, the heads of the two original representatives of *Rhabdomesus (bacillus* and *bacilloides)* are missing RICHARDSON could know nothing about the shape of the antennae which in those two species might very well have had an elongate third segment.

In 1916 (p. 55) HANSEN showed that also *Ischnomesus bispinosus* has two pleon somites, and that the main difference between *Ischnomesus* and *Haplomesus – Heteromesus* consists in the fact that the pleon somites in the former are free and movable, while in the latter two species they are coalesced and moreover fused with the posterior pereion somites. Having thus demonstrated the concordance in number of pleon somites in *Ischnomesus* and *Rhabdomesus* he proposed to incorporate the latter genus under the former one. In *Ischnomesus* he also included two new species from the Ingolf, *I. profundus* and *I. armatus*. He does not, however, mention *inermis*, because he was not aware of VANHÖFFEN's paper, published two years earlier (certainly on account of the war); probably he would have transferred *inermis* as well to *Ischnomesus* since VANHÖFFEN expressly states that it has two pleon somites without mentioning whether they are coalesced or not.

Through the courtesy of Dr. H.-G. HELMCKE and Dr. H.-E. GRUNER of the Berlin Museum I have been able to borrow the type specimen of *inermis* Vanh. A thorough examination showed that *not only are the two pleon somites clearly fused, but there is also a definite fusion between pleon and the seventh pereion somite.* Therefore, *inermis* cannot belong to the genus *Ischnomesus* but must represent a distinct genus which forms a connecting link between *Heteromesus* (with pereion somites 6 and 7 fused with the abdomen) and *Ischnomesus* (with all pereion somites and the two pleon somites free and movable).

The generic name *Rhabdomesus* under which *inermis* was described is, as shown above, a synonym of *Ischnomesus,* since the two species on which the genus was based by Richardson *(bacillus* and *bacilloides)* definitely belong to *Ischnomesus,* having the posterior pereion somites and the two pleon somites free and movable. I therefore propose *Stylomesus* for the species *inermis.*

The species described as *Rhabdomesus bacillopsis* by Barnard (1920, p. 412) must also be transferred to *Ischnomesus* because of the non-coalesced posterior pereion and pleon somites.

Before continuing to the treatment of the separate genera it may be useful to give a key to the four genera of Ischnomesini.

1. Three posterior pereion somites movable; pleon consists of two movable somites. Third segment of peduncle of antenna 2 not twice as long as the fourth. Uropods with two segments. *Ischnomesus* Rich. 1908
At least the posterior pereion somite and pleon immovably fused, constituting a single piece. Third segment of antenna 2 more than twice as long as fourth 2
2. Only the posterior pereion somite and pleon fused. Uropods with two segments . *Stylomesus* nov. gen.
At least the two posterior pereion somites and pleon fused. Uropods with one segment 3
3. Only the two posterior pereion somites and pleon fused. Body moderately slender or proportionately robust. Antenna 1 with reduced third peduncular segment and flagellum .... *Heteromesus* Rich. 1908
The three posterior pereion segments and pleon completely fused. Body slender to extremely slender. Antenna 1 with well-developed peduncle and flagellum, each consisting of three segments .... *Haplomesus* Rich. 1908

Ischnomesus Richardson, 1908

As shown above altogether six species belong to *Ischnomesus,* and the Galathea obtained two more species. The general appearance of these eight species is, however, rather different. I have therefore tried to find valid characters of generic value which might justify the establishment of one or a couple of new genera.

As material I had before me the type specimens of six of the eight species and a large collection of *I. bispinosus* in this Museum. The result of the study is given in the following table in which I have included all varying characters of major significance. The table clearly shows that only two of the species *(bispinosus* and *profundus)* agree in almost all respects. None of the other six species resemble these two or each other to the same extent (except perhaps the two very incomplete Challenger species). It might therefore seem necessary to split up these eight species into several genera (even up to five or six). However, the characters common to these eight species and different to those of the other three genera of this group *(Haplomesus, Heteromesus* and *Stylomesus)* are so essential that I have found it most natural to combine these eight species in one genus only, *Ischnomesus.*

Generic characters of Ischnomesus Richardson

Body slender or very slender, pereion somites 4 and 5 being longer or much longer than any other pereion somites. All somites mutually free and movable. Pleon consists of two movable somites; the first is very short. Antennae 1 well developed, with at least six segments. Antennae 2 with third segment moderately short, not twice so long as the fourth. Maxillipeds with second segment rather large, its lobe at least as long as broad, and less than half as broad as the segment; the palp at least as long as the second segment, the lobe not included. Pereiopod I with the carpus more or less expanded, broadest before the middle. Uropods with two segments.

During the investigation of generic characters I have carefully studied the type specimens of Hansen's *Ischnomesus profundus* and *I. armatus* in this Museum and of Beddard's *I. bacillus* and *I. bacilloides* in the British Museum. Before describing the two new Galathea species I shall point out some features not mentioned by those authors.

Ischnomesus profundus Hansen, 1916

The only specimen known is a male. The shape of pleopoda 1 and 2 is given in fig. 1 a & b. When in the natural position as part of the operculum the outer margins of the first pair of pleopods are partly covered by the second pair as shown by Hansen (pl. IV, 5 f). Actually the outer margin of *pleopod 1* has a marked incision about half way from the base. From here on towards the end the margin is convex.

Table 1. Variation of specific characters within the genus *Ischnomesus*

	I. bispinosus (G. O. Sars)	*I. profundus* Hansen	*I. armatus* Hansen	*I. (R.) bacillus* (Beddard)	*I. (R.) bacilloides* (Beddard)	*I. (R.) bacillopsis* (Barnard)	*I. bruuni* Wolff	*I. spärcki* Wolff
Spines on somites 4 and 5	**absent**	**absent**	present	present	present (?)	present	present	present
Number of segments in flagellum of antenna 1	3	3	**4-5**	?	?	3	**7**	3
3rd segment on antenna 2 more or less than twice as long as 4th segment	less	less	less	?	?	less (?)	less	less
Palp on mandible	absent	absent	absent	?	?	absent	**present**	absent
Width of 2nd and 3rd segment of palp on maxilliped in relation to lobe	broader	broader	broader	?	?	broader (?)	**not broader**	broader
Shape of carpus of periopod I	expanded	expanded	**not much expanded**	?	?	?	**not much expanded**	**not much expanded**
Length of pereiopod VII in relation to IV and V	shorter	?	?	**not shorter**	?	shorter (?)	**not shorter**	**not shorter**
Shape of pleopod 1 in male	**simple**	**simple**	with calcified plates	?	with calcified plates	with calcified plates	with calcified plates	**simple**
Width of pleopod 2 in male	**broad**	**broad**	narrow	narrow	narrow	narrow	narrow	narrow
Penial filament (stylet) of pleopod 2	**short**	**short**	long	?	very long	long	very long	**short**
Exopodite on 1st segment of uropod	**present**	?	absent	absent	absent	absent	absent	absent
Total length of animal	2.5-3 mm	4 mm	4.8-4.9mm	**13-14 mm**	**14-15 mm**	7 mm	**13.5 mm**	**16 mm**

The outer corner of the apex is produced like in *I. bispinosus* and its median part furnished with three short setae.

Pleopod 2 (fig. 1 b) is broad and rounded and the copulatory organ (stylet) is very short and abruptly acute.

Right mandible (fig. 1 c) has a simple cutting edge with only one conspicuous denticle and another, almost invisible denticle below it. There are only four spines in the spine-row. The molar process is very short.

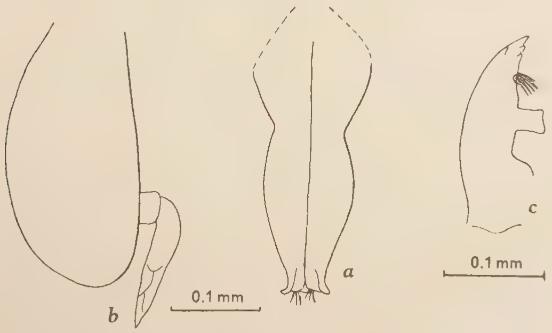

Fig. 1. *Ischnomesus profundus* Hansen ♂, type specimen; a, pleopoda 1; b, left pleopod 2; c, right mandible.

Maxillae 1 and 2 of the ordinary shape.

All other characters were sufficiently described and illustrated by HANSEN.

Ischnomesus armatus Hansen, 1916

Of this species two specimens were preserved in the type collection, one purely white male and another male, apparently discoloured by rust. HANSEN mentions one specimen only which was no doubt the white one (mouth parts dissected). This one has therefore been regarded as the holotype by me and further necessary dissection was made on this specimen.

Differences between the holotype and specimen II: The length of the rusty coloured specimen (specimen II) is 4.9 mm, i.e. 0.1 mm longer than the type. It is

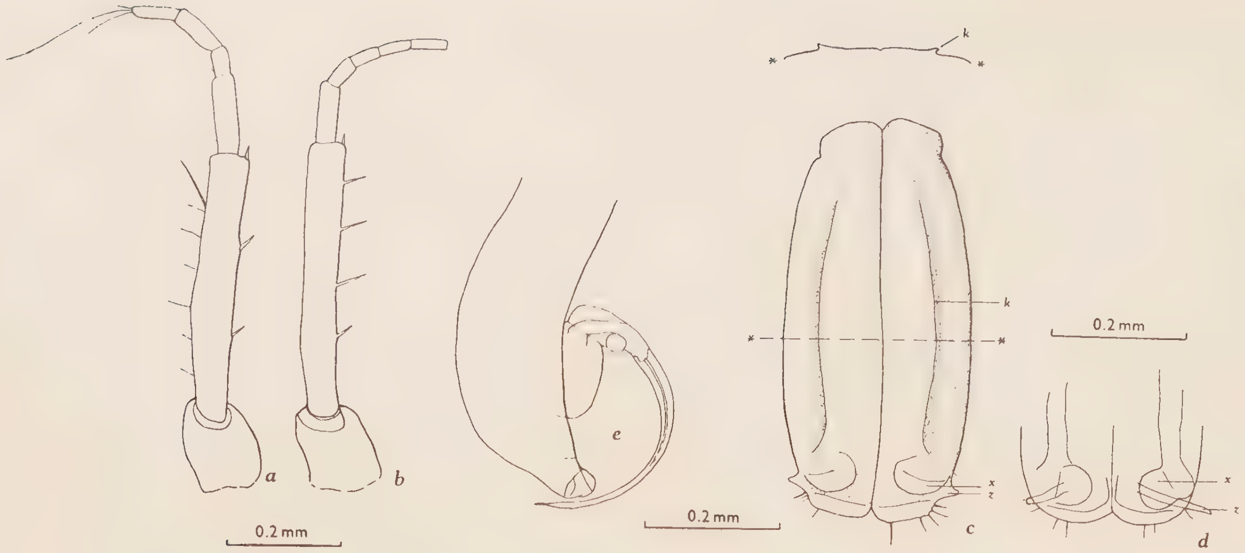

Fig. 2. *Ischnomesus armatus* Hansen; a, left antenna 1 of type specimen, seen from above; b, left antenna 1 of specimen II; c, male pleopoda 1 of type, seen from inside (dorsal view); d, apex of male pleopoda 1 of specimen II (k, keel; x-z, see the text); e, left male pleopod 2 of type specimen.

a little less slender than the type; the ratio between the total length of the animal and the width of somite 2 (at base of spines) is 8.9 in the type and 8.5 in specimen II. – Antennae 1 show a marked difference in the two specimens (fig. 2a & b). In the type it agrees with HANSEN's description except for the fact that the second segment on the interior, lower corner of the distal end is furnished with a short, strong spine. In specimen II only the left antenna 1 is preserved. The second segment is a little longer than in the type and has four spines along the inner margin. The third segment is shorter by one fourth than in the type, and there are at any rate four segments in the flagellum of which the two proximal ones are a little shorter than the two distal ones.

Pleopod 1 has in both specimens an outer shape according to HANSEN's description. On the dorsal (interior) side there is an almost invisible calcified plate near the distal end (x in fig. 2 c & d), corresponding to the one described in *I. bruuni* (p. 93). This plate seems to cover a transversal groove in which a non-calcified organ (z) can be seen at very great magnification (most clearly in specimen II). In both specimens it projects beyond the rounded, outer margin of the pleopod. It will be further discussed on p. 93. The strongly calcified, vaulted end of the pleopod found in *I. bruuni* (y) is here indicated by a very faint seam. Finally, the dorsal (inner) side of the pleopod is furnished with a longitudinal keel, k, visible from near the base of the appendage to the calcified plate.

Pleopod 2 (fig. 2e) is very narrow. The copulatory organ is longer and much more slender than in *I. profundus* and *bispinosus*.

Pleopod 3 like that of *I. bruuni* (p. 94).

All other characters according to HANSEN's description.

Ischnomesus bacilloides (Beddard), 1886

During a visit to London I studied the incomplete type specimen of which only the pereion somites 4-7 and the pleon are preserved.

BEDDARD gives a good description of pleopods 1 and 2 (p. 46) and his figures (pl. VI, 10-11) agree well with the description. The arrangement of calcified plates shows a marked difference to that of *I. armatus* (described above) and *I. bruuni* (p. 93). Unfortunately, the pleopods have not been kept, so we must fully rely on BEDDARD's figure. By comparing the arrangement of plates in the three species it is easily seen that *armatus* and *bruuni* agree in almost all details. BEDDARD, however, gives the following description of the plates in *bacilloides:* "At the upper extremity of the operculum are two minute calcified plates . . ." A corresponding illustration (fig. 3) shows that they project beyond the terminal end of the pleopod. In my opinion plate y in BEDDARD's figure is homologous with y in the two other species. BEDDARD's "plate" z resembles z in *bruuni* and seems to have the same terminal segmentation. However, BEDDARD gives this plate as calcified which it is clearly not in *bruuni* and *armatus*. The calcification of z may be a miscomprehension

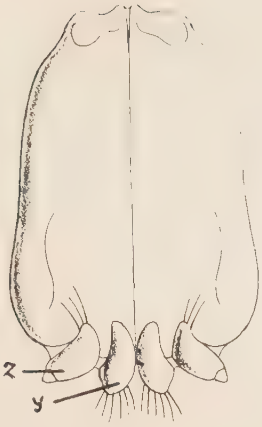

Fig. 3

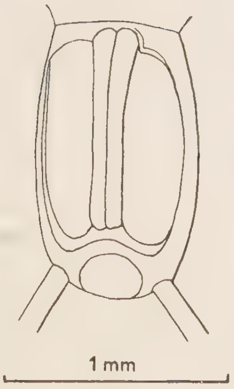

Fig. 4

Fig. 3. *Ischnomesus bacilloides* (Beddard) ♂; pleopoda 1; y-z, see the text (after Beddard 1886, pl. VI, 11).
Fig. 4. *Ischnomesus bacillus* (Beddard) ♂; pleon of type specimen, seen from below.

by Beddard. I found it very difficult to get a proper impression of these minute organs which can only be seen when shutting down the transmitted light etc. Plate x in *bruuni* and *armatus* was probably also present in *bacilloides,* but may have been overlooked. Barnard (1920, p. 414) described pleopod 1 in *I. bacillopsis* as "very similar to Beddard's figure of that of *bacilloides,* but apices of peduncles and rami not prominent". Unfortunately, Barnard gives no figure. – The longitudinal line in the middle of each pleopod (fig. 3) seems to indicate a similar groove and keel as in *bruuni* and *armatus* (k), but they are not mentioned in Beddard's description.

All pereion and pleon somites are free and movable.

The length of the fragment is 11 mm. By comparison with the two species from the Galathea the total length of the animal can tentatively be given as 14-15 mm.

Ischnomesus bacillus (Beddard), 1886

Also the present species is known only from the type specimen which is incomplete, comprising – like *I. bacilloides* – somites 4-7 and the pleon only. It has been mounted on a slide. Beddard gives the fragment as a female but it is definitely a male.[1] The male pleopoda 1 can be clearly seen when the transmitted light is shut down (fig. 4). Pleopoda 1 are a little longer than 2, being inserted a little more anteriorly. At the distal end the two pairs of pleopoda reach almost equally far backwards. The uropod has two segments.

The rest of Beddard's description is correct. All pereion and pleon somites are free and movable. Relative length of pereiopods IV-VII is mentioned on p. 87.

The length of the fragment is 10 mm, which indicates a total length of 13-14 mm.

Ischnomesus bruuni n. sp.

Material:

St. 651, Kermadec Trench (32°10'S, 177°14'W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1, 3° C. – 1 complete male.

Description:

Body (figs. 5 & 6a) very long and slender and quite smooth. Rate between total length of animal and width of second pereion somite (at base of spines) is 8.7.

Head broader than long and somewhat immersed in the first pereion somite, the suture being slightly convex.

Pereion somites 1-3 subequal in size and shape. Somite 1 a little shorter than 2; its lateral parts embracing the base of the head and furnished with a pair of spines directed outwards and forwards and shorter and stouter than those in *I. bacillopsis* (Barnard 1920, pl. XVII, 13) and *I. armatus* (Hansen 1916, pl. IV, 6 b). Somites 2 and 3 somewhat broader (between base of spines) than long and with spines which in somite 3 are directed more outwards than

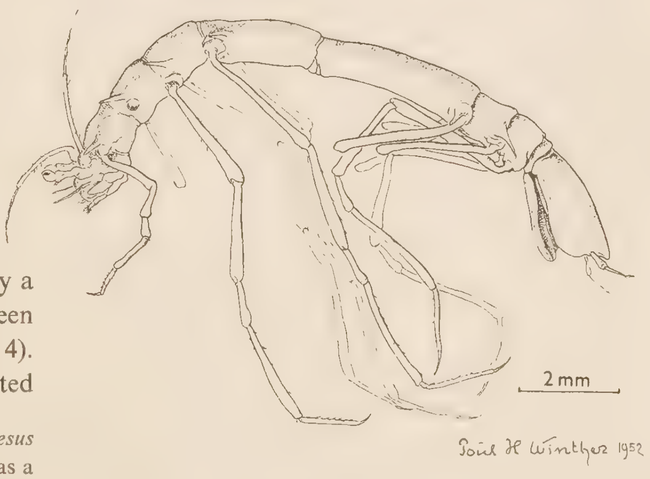

Fig. 5. *Ischnomesus bruuni* n. sp. ♂; type specimen from the Kermadec Trench, 7000 m.

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[1] In his description of *Ischnosoma spinosum (= Heteromesus spinosus)* Beddard gives the only specimen existing as a female, but on plate VI it is mentioned as a male. The individual *is* a female.

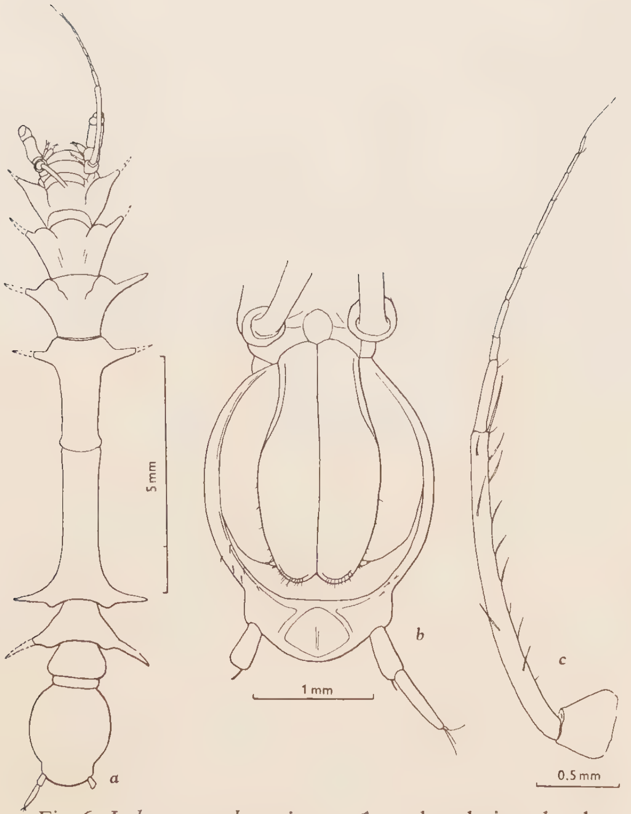

Fig. 6. *Ischnomesus bruuni* n. sp. ♂; a, dorsal view; b, pleon from below; c, lateral view of left antenna 1.

in 1 and 2. The tips of most of the spines have been broken off.

Somite 4 typically T-shaped; it is as long as 2 and 3 together; the spines are directed outwards and a little forwards. *Somite 5* as long as somites 1-3, with the spines directed outwards at right angles to the longitudinal axis of the body and much shorter than in *bacilloides*. *Somite 6* shorter than any of the preceding somites. The spines are directed outwards and backwards and are moreover curved slightly backwards; they are probably a little longer than any of the preceding spines, but not so long as those in *armatus*. *Somite 7* is a trifle shorter than 6, rounded and without spines.

Pleon consists of two segments which are free and movable. The first is very short and only three-fifths as wide as the second. This one is of almost the same shape as in *bacilloides* (BEDDARD 1886, pl. VI,9) and *armatus*. It differs from *bacilloides* in having the outer, convex margin rounded equally much near the base and towards the end. In *armatus* the posterior end has the margins bent somewhat outwards, while in *bruuni* they are parallel and relatively shorter. The somite is one-fourth as long as broad and also one-fourth longer than thoracic somites 6 and 7. The posterior margin is convex, with the uropods inserted at its end.

On the ventral side of pleon (fig. 6b) the cavity containing the pleopods occupies a comparatively bigger area than in *bispinosus* (SARS 1899, pl. 52), *bacilloides*, and *armatus;* the bar separating the cavity from the anal opening is therefore narrower than in those species. Its anterior margin is straight, not convex as in *bacilloides*.

Antenna 1 (fig. 6c) reaches backwards a little beyond the anterior end of pereion somite 4. The first segment is short and thick, the second a little longer than all the succeeding segments together, with numerous thin setae and a long terminal spine on the ventral side. 3rd segment scarcely one fifth of the second. The flagellum consists of seven segments. In the left antenna segment 4 is short, segments 5-8 are equally long, while 9 and 10 are again somewhat shorter. There is one long and two short, terminating, sensory hairs. In the right antenna segment 4 resembles that of the left antenna, segments 5 and 6 are shorter than the corresponding segments in the left antenna, 7 is twice as long as 4, and segment 8 is still longer, being twice as long as 5. The two last segments are broken off.

Antenna 2 (fig. 6a) is on both sides represented by the peduncle only, consisting of four segments. Segments 1, 2 and 4 are subequal in size and about as long as broad. Segment 3 is twice as long as broad and a trifle less than twice the length of segment 4.

Left mandible (fig. 7a) has a very broad, 6-dentate cutting edge. The movable lacinia is 3-dentate and the spine-row has eleven spines. Molar process is very prominent, resembling that of *armatus*. There is a 3-segmented palp which is not found in any other species of Ischnomesini in which it has been looked for. The palp on the right mandible is a little different and is shown in fig. 7b.

Maxillae 1 and 2 are of the typical shape. At the base of maxilla 2 there is a tuft of long hairs (fig. 7c).

Maxilliped (fig. 7d) very much like in *bispinosus* and *armatus*, but the first three segments of the palp are narrower.

Pereiopod I (fig. 7e). The length of basis is four-fifths of the three following segments together, slender and without spines. Ischium somewhat less than half as long as basis. Merus short and broad with a short stout spine on the antero-interior corner. Carpus only moderately broad (as in *inermis* (VANHÖFFEN 1914, p. 561) and *armatus)*, more than twice as long as broad. Along the inner margin there is a fairly short cutting edge and five longer and three shorter spines. Propodus narrow, seven times longer than broad. Dactylus short.

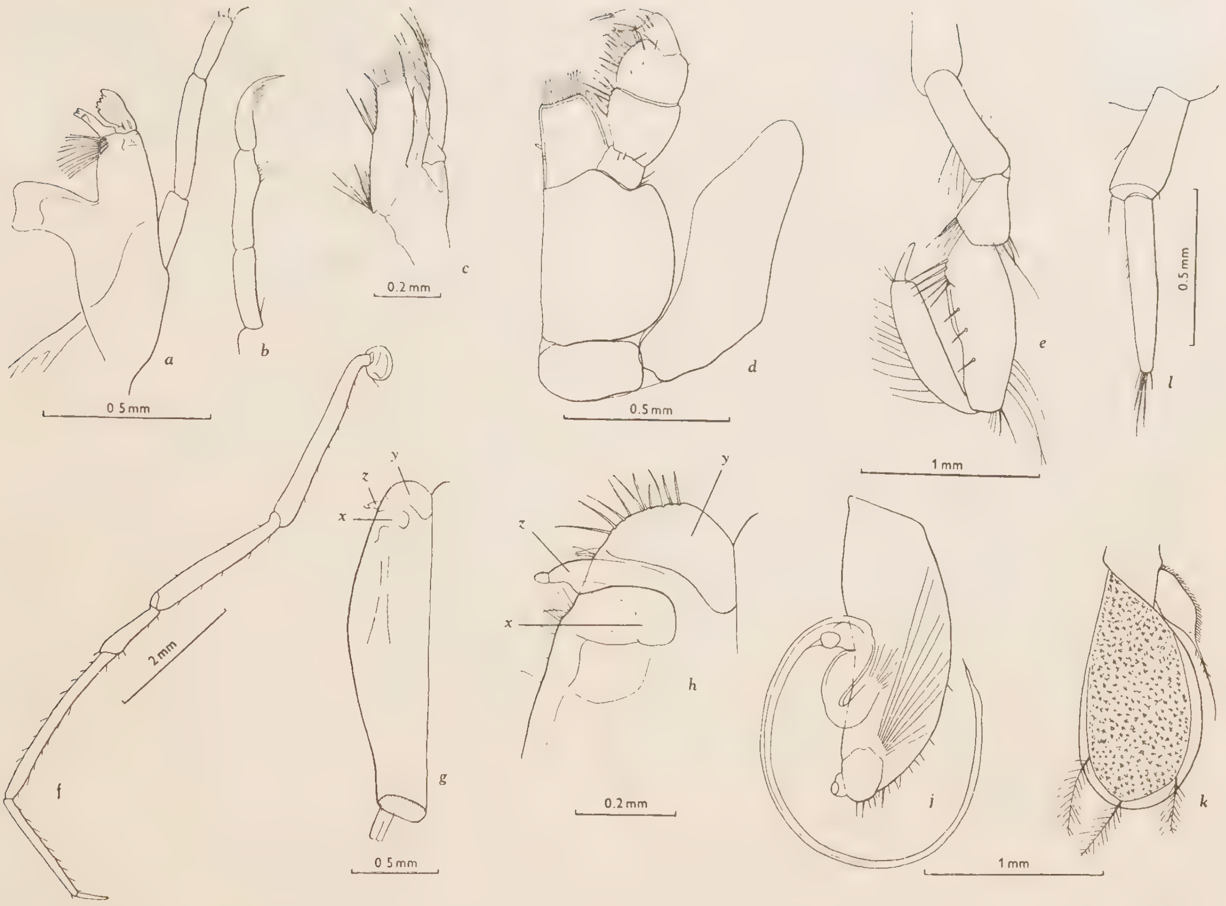

Fig. 7. *Ischnomesus bruuni* n. sp. ♂; a, left mandible; b, palp of right mandible; c, left maxilla 2; d, left maxilliped; e, right pereiopod I, seen from below; f, pereiopod IV; g, right pleopod 1, seen from inside (dorsal view); h, apex of the same (x-y-z, see the text); j, right pleopod 2; k, right pleopod 3; 1, left uropod.

Pereiopod III, IV (fig. 7f), *and VII* are all present and of equal shape and length, III being only a trifle shorter than the others. Basis of pereiopod V and VI are also present and are exactly like basis of the three other appendages. Total length of pereiopod IV is 10.5 mm. The mutual length of the segments can be seen in fig. 7f. This appendage is more slender than in *bispinosus,* less spiny than in this species and *inermis* and dactylus is much shorter than in any of these species and in *bacillus* (BEDDARD 1886, pl. VI, 7).

Male operculum somewhat longer than broad and as usual consisting of the first and the outer two thirds of the second pair of pleopods.

Pleopod 1 (figs. 6b & 7g-h) is four times as long as broad, with rounded base and apex; the outer margin is concave near the base, convex towards the end. It is somewhat vaulted both longitudinally and transversely. On the dorsal side (fig. 7g & h) are found the peculiar calcified plates which are also present in *armatus, bacilloides* and *bacillopsis* and are described and compared on p. 90. In the present species the calcified plate x is very distinct and nearly twice as broad as long. It is only in connexion with the pleopod along the anterior (basic) margin, being inserted in a slightly oblique position so that a low cavity is formed beneath it. The apex of the pleopod consists of another calcified plate (y) which is strongly vaulted and furnished with long setae on the outer corner. The two plates x and y partly cover a transverse groove in which a non-calcified organ (z) is faintly visible. As in *armatus* it projects beyond the rounded outer margin of the pleopod and is distinctly seen here. Near its end there seems to be a segmentation. This organ probably represents the distal segments of the highly modified first pleopod. I can hardly believe that it plays any rôle in the copulation; in this as in other Asellota the main purpose of the first pair of pleopods is to protect the fragile inner part of pleopoda 2 which are modified into the copulatory organs.

Pleopod 2 (fig. 7j) is narrow and furnished with a very long penial filament, although not quite so long as in *bacilloides.* It is considerably longer and more slender than in *armatus* (p. 90). Beddard mentions that the second pleopod in *bacilloides* "terminates posteriorly in two longish spines of a yellow colour, one arising from the ventral, the other from the dorsal side of the joint". In the present species I have found at the outer corner of the base of pleopod 1 a similar yellow-coloured projection which is, however, a short and strong muscle. Possibly this is also the case with these peculiar "spines" on pleopod 2 in *bacilloides*.

Pleopod 3 (fig. 7k) is much more rounded than in *bispinosus*, the only *Ischnomesus* species in which it was hitherto fully described. The exopodite is also much shorter and terminates more abruptly in the comparatively long, hairy filament. According to Beddard's description of the exopodite in *bacilloides* it is of the same general shape as in *bruuni*, but the filament is considerably longer in the former species (pl. VI, 12).

Uropod (fig. 7 l) with two segments, the first about two thirds of the second and twice as broad. At the end of the second segment there are five shorter or longer setae.

Size: Total length 13.5 mm.

Remarks:

In general appearance *I. bruuni* mostly resembles *armatus* and *bacilloides*, which have the same armament with spines on the pereion somites. From *armatus* it differs in having the spines on somites 3-5 directed outwards instead of forwards, and all spines are shorter and more slender; besides, the shape of pleon and of pleopod 1 is somewhat different, palp on mandible is present, the total length is almost four times the length of *armatus*, etc. – From *bacilloides* it differs in being less slender and having much shorter pereion spines; there are some differences in the shape of the pleon; shape and arrangement of calcified plates on pleopod 1 are quite different; first segment of uropods is shorter and broader; besides, there are still a few minor differences. However, these two species are certainly very closely allied and it is much to be regretted that only the posterior half of *bacilloides* was preserved and that later on the significant pleopoda 1 have been lost.

The presence of a mandibular palp in *bruuni* only should not involve that this species is made the type of a separate genus. It is now generally accepted that within the Parasellidae presence or absence of a palp on the mandible is not of generic value. For instance, the well defined genera *Desmosoma* and *Ilyarachna* both comprise species with and species without a mandibular palp (Hult 1936 a).

The present species is named after Dr. Anton Fr. Bruun, Scientific Leader of the Galathea Expedition.

Distribution:

So far only known from the Kermadec Trench NE of New Zealand, 6960-7000 m, 1.3°C.

Ischnomesus spärcki n. sp.

Material:

St. 651, Kermadec Trench (32°10'S, 177°14'W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 1 complete male.

St. 658, Kermadec Trench (35°51'S, 178°31'W), 6660-6720 m, 20. Febr. 1952. Gear: 6 m sledge trawl. Bottom: brown sand with clay and stones. Bottom temp.: 1.3°C. – Anterior half of 1 specimen.

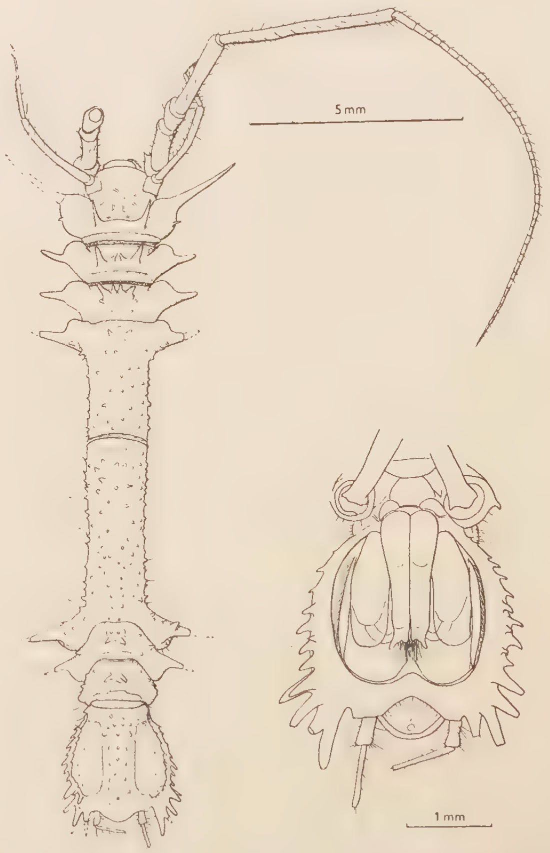

Fig. 8. *Ischnomesus spärcki* n. sp. ♂; type specimen from the Kermadec Trench, 7000 m; dorsal view (left); pleon from below (right).

Description:

Body (fig. 8) is not so slender as in *I. bruuni,* the ratio between total length of animal and width of second pereion somite (at base of spines) only being 5.9. Besides the stout lateral spines, especially somites 4 and 5 and the pleon are furnished with a great many small tubercles on the dorsal and lateral sides.

Head broader than long and somewhat immersed in the first somite.

Pereion somite 1 with vaulted lateral parts, embracing the base of the head and furnished with a pair of long, slender spines, being more than half as long as the width of the somite and directed outwards and forwards. On the dorsal side of the somite there are moreover two shorter spines, directed upwards and a little forwards and outwards; they are connected by a low keel.

Somites 2 and 3 subequal, with vaulted lateral parts, furnished with rather short spines which are directed outwards and a little forwards. On the dorsal side of somite 2 there are two spines which are almost as long as those on somite 1 and with the same direction. Between them are two shorter spines, directed upwards and inwards towards each other. The same arrangement of dorsal spines is found on somite 3, but here all four spines are more distinctly placed on a common base and the two lateral spines are shorter than the preceding ones. Furthermore, there are behind them two median spines which are shorter and directed upwards.

Somite 4 of the same general shape as in the other species of the genus. It is somewhat longer than somites 1-3 together and the width at the posterior end is about half the length of the somite. Besides the lateral pair of spines, which are a little longer than the preceding pair, there are two median spines, directed upwards and somewhat outwards and as long as the median pair on the preceding somite.

Somite 5 is as long as somites 2-4 together and more than three times longer than wide. The lateral spines are directed outwards and a little backwards and are longer and stouter than any other lateral spines. There are no significant median spine-pairs but a great many small spines and tubercles are found on the dorsal and lateral surfaces of this somite as well as on the preceding one.

Somites 6 and 7 are broad and short, the former with a pair of rather slender lateral spines, directed outwards and somewhat backwards. Both somites with a median pair of spines, which are quite short on somite 6.

Pleon has two free and movable somites the first of which is very short. The second somite has a peculiar shape. As in *Storthyngura furcata* (p. 119) the pleotelson is divided by two longitudinal furrows into three almost equally broad convexities, the median being a little narrower than the lateral ones. The median convexity widens anteriorly and is thus T-shaped. The two lateral ones are of an oval shape and terminate a little in front of the hind margin of the pleon, while the median convexity continues on the rounded process which forms the median part of the hind margin. Along the lateral margins are rows of spines, increasing in size to-

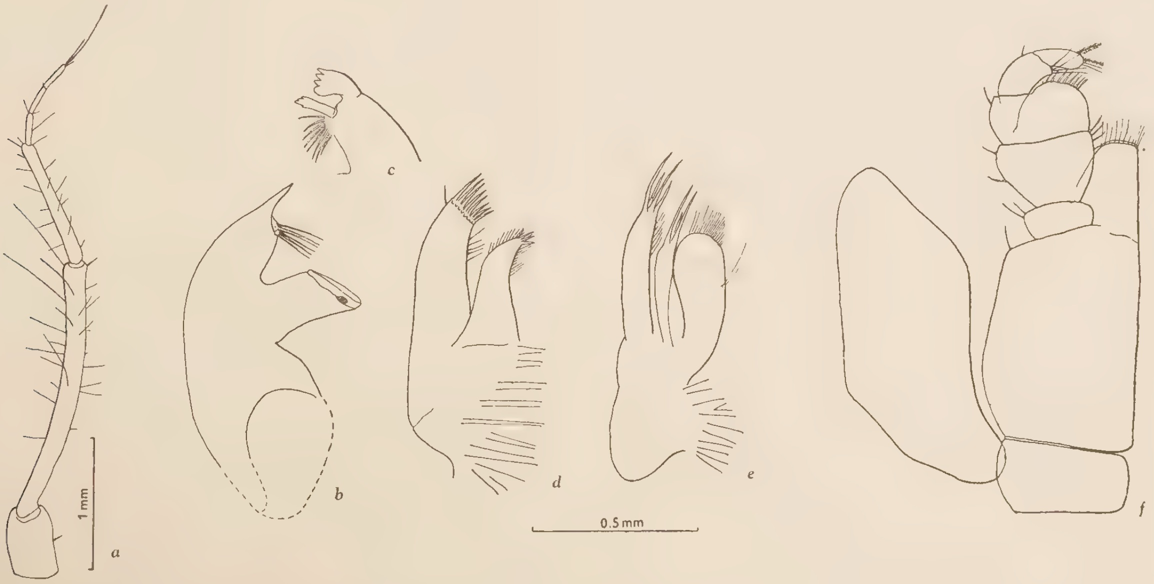

Fig. 9. *Ischnomesus spärcki* n. sp.; a, lateral view of right antenna 1; b, right mandible; c, cutting edge, movable lacinia, and spine-row of left mandible; d-e, right maxillae 1 and 2; f, right maxilliped.

wards the posterior end and being asymmetrically arranged.

On the ventral side of pleon (fig. 8) the bar separating the cavity in front from the anal opening behind is bent somewhat forwards.

Antenna 1 (fig. 9a) reaches backwards a little beyond somite 3. Second segment very slender and somewhat longer than all succeeding segments together, with numerous thin setae. Segment 3 a little less than half as long as 2. The flagellum consists of three equally long segments which are together shorter than segment 3. There are three terminal, sensory hairs.

Antenna 2 (fig. 8) is complete on the right side. The first segment is very short. Segments 2 and 4 are equally long, the former a little broader and with a spine on the antero-interior, distal corner. Segment 3 less than twice as long as 4. Segment 5 a little more slender than 4 and longer by one sixth than the preceding four segments together. The next segment still more slender and one and a half times as long as segment 5. The flagellum with about 43 segments of which the first is the longest. The total length of the flagellum is slightly greater than the rest of antenna 2.

Right mandible (fig. 9b) has a simple, spine-like cutting edge as in *profundus* (fig. 1c). There are six spines in the spine-row and the molar process is very prominent and obliquely cut off. *Left mandible* (fig. 9c) has a broad cutting edge, with four blunt teeth of which the uppermost is very broad. The movable lacinia is also broad and has three major, terminal teeth and a fourth small, upper tooth. Nine spines in the spine-row and a prominent, straightly cut off molar process. There is no palp on any of the mandibles.

Maxillae 1 and 2 (figs. 9d & e) typically shaped.

Maxilliped (fig. 9f) has a narrower second segment than all the other species, but the first three segments of the palp of the usual width. The epipodite is broader than in the other species except *bispinosus*.

Pereiopod I (fig. 10a) short as in the rest of the species, only less than half as long as pereiopod VII. Basis somewhat shorter than the three succeeding segments together. Ischium half as long as basis. Merus is broader than wide and carpus is rather narrow, somewhat more than twice as long as wide, with a row of rather short, stout spines along the antero-interior, concave margin.

Pereiopods II-VII. Only basis of all succeeding pereiopods is present – except VII, which is complete. Basis of II and V are shorter by one sixth than in the rest of the pereiopods, which no doubt means that these two pereiopods were shorter on the whole. Pereiopod VII (fig. 10b) has a total length of almost 12 mm. Ischium is relatively shorter than in any other *Ischnomesus* species in which the pereiopods are preserved, being only three-fifths of carpus. Dactylus is longer than in *bruuni* but shorter than in *bispinosus*.

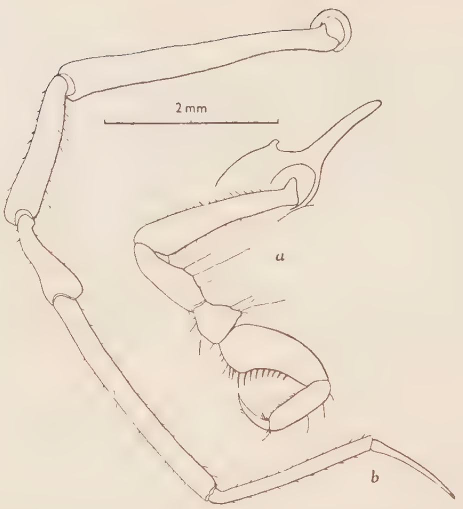

Fig. 10. *Ischnomesus spärcki* n. sp.; a, right pereiopod I; b, right pereiopod VII.

Male operculum (fig. 8) shorter than in any other *Ischnomesus* species in which it is known; it is only one fifth longer than wide. Rest of the cavity is occupied by pleopods 3 and 4.

Pleopod 1 of male (fig. 11a) is narrow and of the same general shape as in *bispinosus* and especially *profundus* (fig. 1). The base is rounded, and the outer corner of the apex is still more produced than in *profundus*. Also the endopodites are slightly projecting and furnished with many long hairs. The ventral (outer) side of the pleopod is somewhat vaulted and more highly calcified in the anterior third than in the remaining part of the pleopod, especially towards the apex. In the anterior third of the dorsal (inner) side there is a pair of concavities, separated by a median keel. The middle part of the pleopod is concave with raised lateral margins which continue as low keels towards the central part of the posterior end where they disappear.

Pleopod 2 (fig. 11b) has the apex cut off almost straightly, thus obtaining a somewhat rectangular shape. The apex is furnished with several long setae. The copulatory organ is extremely short, only a little longer than in *profundus*.

Pleopod 3 (fig. 11c) resembles that of *bispinosus*, having a similar exopodite tapering towards the end,

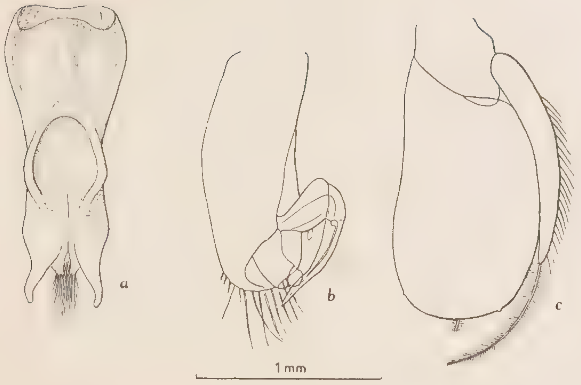

Fig. 11. *Ischnomesus spärcki* n. sp. ♂; a, pleopoda 1, seen from inside (dorsal view); b, left pleopod 2; c, left pleopod 3.

but the endopodite is more rounded, although not so rounded as in *bruuni*.

Uropod (fig. 8) with two segments; the first about half as long as the second and more than three times as broad. Both segments with long, thin setae.

Size: The total length is 16 mm and *I. spärcki* is thus the biggest hitherto known species of *Ischnomesus*.

Variation:

The anterior half of one more specimen from another station in the Kermadec Trench is preserved. The head and somites 1-4 are present, and both pairs of antennae are complete. The size of the two specimens is exactly the same, and this also applies to the shape of head and somites as well as to length and arrangement of the lateral and median spines on the somites. The only difference is found in the length of the antennae. Both the first and the second pairs are longer in the type specimen, the first pair even longer by one fourth. This seems to indicate that the present fragment is of a female.

Remarks:

Especially the shape of the pleon and the armament with median spines on pereion and lateral spines on pleon clearly separate this species from any other *Ischnomesus*. On the other hand, it falls well within the limits of the genus. In some respects it seems to be more nearly related to *bispinosus* than to any of the other species. Agreement with *bispinosus* exists in the shape of the male pleopods and to some extent of the mandible. On the other hand, it differs decidedly in many characters, such as armament with principal spines, shape and length of pereiopods, lack of exopodite on uropod, etc. From *bruuni*, the other species from the Kermadec Trench, it differs first and foremost in lack of palp on mandible and shape of male pleopods, but the general appearance is rather equal.

The species is named after Professor Dr. R. Spärck, Vice-President of the Committee of the Galathea Expedition.

At Galathea Station 663 (Kermadec Trench, 4410 m) a female was caught which is very near to *I. spärcki*. After a careful comparison I decided to regard the female as a separate species, mainly on account of the following differences: Presence of principal spines on the epimera and the posterolateral corners of somite 4, the lateral parts of somite 7, and the hind margin of pleon which are all missing in *spärcki;* lack of median spine-pair on the dorsal part of somites 2 and 3; four segments in the flagellum of antenna 1; carpus of pereiopod 1 expanded; basis of pereiopod V as long as that of III, IV, and VI and basis of VII shorter than any of these.

At Galathea Station 575 (Tasman Sea, 3710 m) a fragment consisting of pereion somite 1-4 and pereiopod I was caught. The shape of these few remaining parts are very near to *spärcki* although not near enough to refer the fragment to this species. There is, however, no doubt that it is very closely related to *spärcki*.

The female from St. 663 and the fragment from St. 575 will be described later.

Distribution:

Kermadec Trench NE of New Zealand, 6660-7000 m, 1.3°C.

Stylomesus nov. gen.

Diagnosis:

Body slender, pereion somites 4 and 5 being longer than any other somites. All pereion somites mutually free and movable but the seventh is fused with pleon which consists of two, likewise fused somites. Antennae 1 well developed, with six segments. Antennae 2 with third segment elongate, more than twice as long as the fourth. Maxillipeds with second segment extremely large and its lobe more than half as broad as the segment and much shorter than broad; the palp more than two thirds as long as the segment itself – the lobe not included – and its three proximal segments not expanded, being only a little broader than long. Pereiopod I with carpus of normal shape. Uropods with two segments.

Remarks:

The reasons for erecting this genus are given on p. 87. It comprises one species, *S. inermis* (Vanhöffen), of which only one female is known. Since Vanhöffen's description is rather insufficient I have included a redescription of the species in the present Report.

Stylomesus inermis (Vanhöffen), 1914

Rhabdomesus inermis Vanhöffen, 1914, p. 560, fig. 88.

Description:

Body elongate, 5.3 times longer than broad (width of pereion somite 1).

Head deeply immersed in the first pereion somite and sloping gently downwards. The antennae are inserted on a stout projection which is twice as broad as the third segment of antenna 2 and nearly as long as broad, measured along the outer margin. Only in *Heteromesus dentatus* (Hansen 1916, pl. 5, fig. 6b) a similar, but not nearly so pronounced projection is found. Vanhöffen's fig. 88 shows it in lateral view at the base of the antennae.

Pereion somite 1 is broader than any other pereion somites. Laterally it is as long as each of the two succeeding somites, dorsally it is only a little more than half as long as any of these. On the strongly vaulted antero-lateral corners is a pair of tiny spines with a terminal seta.

Pereion somites 4 and 5 are elongated. The width between the vaulted postero-lateral corners of somite 5 is a little less than the width between the vaulted antero-lateral corners of somite 4; this width is again a trifle less than that of somites 3, 2, and especially 1. The elongate parts of somites 4 and 5 are almost equally broad and circular in section. The length of somite 4 is somewhat shorter than 2 + 3, while 5 is twice as long as somite 4.

Pereion somites 6 and 7 are narrower than the preceding ones, 7 being only half the width of somite 1. Somite 6 is a little shorter than 2 or 3, and 7 is again a little shorter than 6.

Pleon consists of two coalesced somites the anterior of which is one third of the whole pleon. The original segmentation between the pleon and pereion somite 7 and between the two pleon somites is clearly visible as a furrow continuing the whole way round. The shape of the posterior pleon somite is almost circular and the median part is somewhat more vaulted than the lateral sections, almost like the pleon of *Heteromesus schmidti* (Hansen 1916, pl. 6, fig. 3d). Along the convex posterior and lateral margins are a few setae. The total pleon is nearly as long as somites 2 + 3 and the largest width is like that of somite 6.

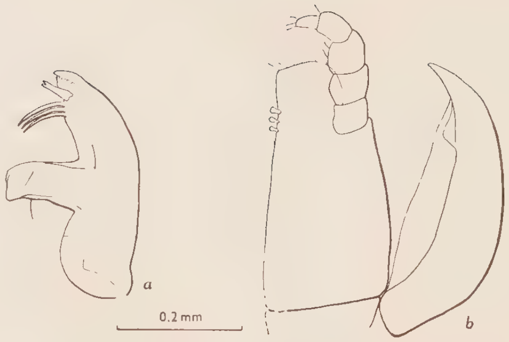

Fig. 12. *Stylomesus inermis* (Vanhöffen); a, left mandible; b, left maxilliped.

Antenna 1 has a thick, oval, basal segment which is half as long and almost three times as thick as the elongate second segment which rises on its upper, interior corner. On the interior margin of segment 2 are two extremely long hairs. Segment 3 is only a trifle narrower than 2 and one third in length. The flagellum consists of three very narrow segments of which the proximal is one third of each of the equally long, distal segments. The whole flagellum is about as long as the two distal peduncular segments together.

Antenna 2 (Vanhöffen's fig. 88) has two very short proximal segments; the distal one is furnished with a long spine on its ventral side. Segment 3 is very elongated and widest at the base. It is almost three times longer than segment 4. The flagellum is lost on both antennae.

Left mandible (fig. 12a) is small and slender. The cutting edge is broad and concave and with tiny rounded denticles. The movable lacinia is slender and bi-furcate and there are three long spines in the spine-row. The molar process is long and slender. There is no palp.

Maxilliped (fig. 12b) has the lateral margins of the second segment deflected inwards at right angles, the segment thus forming a kind of a through; the deflected inner margin is concave, the outer convex. There are three globular coupling hooks. The palp is very slender, although not so slender as in *Heteromesus*. The epipodite curves inwards and somewhat upwards towards the apex thus forming on each side a rounded frame which makes the buccal cavity almost circular. The interior part of the epipodite is almost hyaline.

Pereiopods are all present and are well figured by Vanhöffen. Carpus of pereiopod I is only slightly expanded. II and VII are almost equally long and about one fifth shorter than IV and V.

Female operculum is moderately vaulted and almost circular having a slight convexity at base and being somewhat concave along the distal margin. The lower surface is quite smooth.

Uropod is somewhat more than half as long as abdomen. The two segments are equally long. The first segment is only a little narrower distally than proximally while segment 2 tapers evenly towards the end.

Size: Total length is 5.1 mm and largest width (somite 1) is 0.9 mm.

Remarks:

In shape of body, mandibles and maxillipeds *S. inermis* resembles the species of *Heteromesus* more than those of *Ischnomesus*.

Distribution:

So far known only from the Antarctic Indian Ocean (65°31′S, 85°17′E), at a depth of 2450 m.

Macrostylini Hansen

Macrostylis G. O. Sars

Macrostylis G. O. Sars, 1864, p. 13
Macrostylis G. O. Sars, BEDDARD 1886, p. 173
Vana Meinert, 1890, p. 195
Macrostylis G. O. Sars, 1899, p. 120
Macrostylis G. O. Sars, HANSEN 1916, p. 75

Since HANSEN'S revision of the generic characters of *Macrostylis* three more species belonging to this very well defined genus have been collected, viz. *M. spiniceps* Barnard (1920) and the two species described below. They all agree in almost all details with HANSEN'S careful diagnosis of the genus. The only two exceptions are that *M. hadalis* n. sp. has only one segment in the uropod and that the first three pereion somites in *M. spiniceps* do not "constitute together a separate sub-quadrangular section, with each lateral margin forming a nearly uninterrupted, distinctly convex line"; both according to BARNARD'S description and figure (pl. 17, fig. 10) their postero-lateral angles are acute or sub-acute and nearly as well marked off from each other as are the succeeding four somites in *spiniceps* as well as in the other *Macrostylis* species.

Altogether ten species of the present genus are now known. Most of them are deep-sea forms caught in one or a few specimens only and often more or less incomplete. In the following key the main stress is therefore laid upon characters of head and body rather than on the appendages which so easily break off.

1. Head broader than pereion; its postero-lateral angles acutely produced .... *M. spiniceps* Barnard, 1920
   Head as broad as or narrower than pereion... 2
2. Tip of pleon convex between uropods, but not obtusely produced 3
   Tip of pleon obtusely produced 5
3. Pereiopod VII much longer than body. Antenna 1 almost as long as head *M. longipes* Hansen, 1916
   Pereiopod VII shorter than body. Antenna 1 only half as long as head 4
4. Ventral spines on pereion somites 1 and 6-7 small or missing. Uropods only a little more than half as long as pleon ... *M. subinermis* Hansen, 1916
   Ventral spines or processes on pereion somites 1 and 6-7 long and slender. Uropods almost as long as pleon..... *M. longiremis* (Meinert), 1890
5. Pereion somite 4 narrower than all the others. Uropods almost as long as pereion + pleon, with many segments *M. elongata* Hansen, 1916
   Pereion somite 4 as broad as or broader than the succeeding ones....................... 6
6. Anterior margin of pereion somite 1 straight and lateral margins of somites 1-3 (when seen from the side) irregular. The margins of the ventral pleon excavation curved upwards and forwards distally, thus forming a deep notch (fig. 20a, p. 104). Pereiopods I and II equally long. Uropods with one segment and only two fifths as long as pleon....................... *M. hadalis* n. sp.
   Anterior margin of somite 1 concave and lateral margins of somites 1-3 straight. No deep notch at distal end of pleon. Pereiopod II longer than I. Uropods with two segments and longer than pleon[1] 7
7. No ventral process on pereion somite 1. Pereion somite 5 shorter than 6 and 7. Ischium of pereiopod III with a strong hook-like process on upper margin. Length of basis of pereiopod V only half of succeeding three segments......... .... *M. galatheae* n. sp.
   A forward directed median process on ventral side of pereion somite 1 (at any rate in *M. abyssicola)*. Pereion somite 5 not shorter than 6 and 7. Ischium of pereiopod III with a more or less strong spine on upper margin. Length of basis of pereiopod V $^2/_3$-$^3/_4$ of succeeding three segments 8

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[1] Pereiopod I and uropods missing in *M. latifrons*.

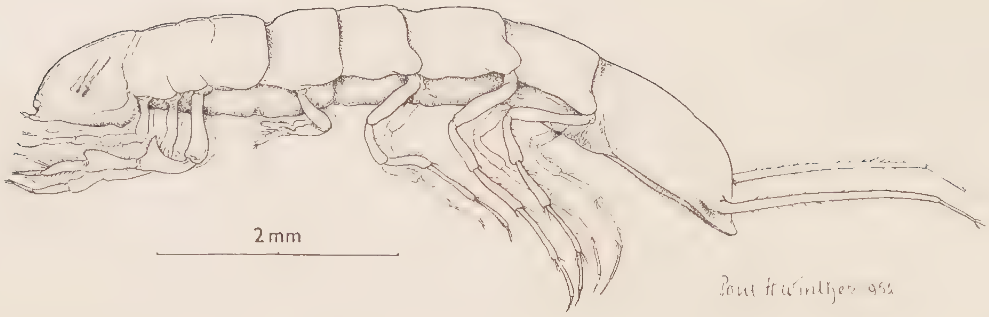

Fig. 13. *Macrostylis galatheae* n.sp.; deepest recorded isopod (Philippine Trench, 9790 m).

8. Pleon as long as pereion somites 6-7. Length of antenna 1 about $^1/_2$-$^1/_3$ of width of head at insertion; number of segments 5 .... *M. latifrons* Beddard, 1886
Pleon as long as pereion somites 5-7. Antenna 1 only $^1/_4$-$^1/_5$ of width of head; number of segments 3 .... *M. abyssicola* Hansen, 1916.

Macrostylis galatheae n. sp.

Material:

St. 435, Philippine Trench (10°20′N, 126°41′E), 9790 m, 7. Aug. 1951. Gear: triangular dredge. Bottom: very stiff clay. Bottom temperature: 2.6°C. – Anterior half (head + 4 somites) of 1 specimen which is probably a male; posterior half of 2 females (respectively 5 and 3 pereion somites + pleon); posterior half of 1 male (3 pereion somites + pleon).

Description:

Body (figs. 13 & 14a-b) slender, more than five times as long as broad, in general aspect mostly like that of *M. subinermis*.

Head (fig. 14a) separated from the first pereion somite by a very marked constriction. Its shape is somewhat squarish with a rather produced section just in front of the very slight sinus for the insertion of the antennae. The frontal part is straight.

Pereion somites 1-3 (fig. 14a) of the characteristic appearance and not movable. The concave anterior and convex posterior borders of the first somite are parallel; the posterior border of the second somite is a little more convex than that of the first; in the third somite the posterior border is straight and has no spines on its angles.

Pereion somites 4-7 (fig. 14b) are separated from each other (and the fourth from the third) by a deep lateral notch and are very movable. In the present, somewhat disentangled, material it is impossible to make out whether they are still in connexion with each other in quite the original way; their relative size is therefore disregarded in this description, but the sixth is definitely the longest and the seventh the longest but one. The lateral regions of the three last somites are widest posteriorly and form a produced, vaulted angle. This is furnished with one spine on somite 5, two spines (male) and three (female) on somite 6, and three spines on somite 7. There are no spines on somite 4.

On the ventral side none of the somites are furnished with keels or the strong spines found on some or all the somites of all other species of *Macrostylis* (except *M. latifrons?).*

Pleon (fig. 15a & b) somewhat less than twice as long as wide and a little longer than the two preceding somites combined. The width at the base is the same as at the insertions of the uropods. The greater part of the lateral margins is distinctly convex. The posterior border is produced backwards as a rounded, median lobe with concave sides towards the uropods. The peculiar organ observed by HANSEN (1916, p. 75) on each side near the posterior end of the pleon is apparently not present in this spe-

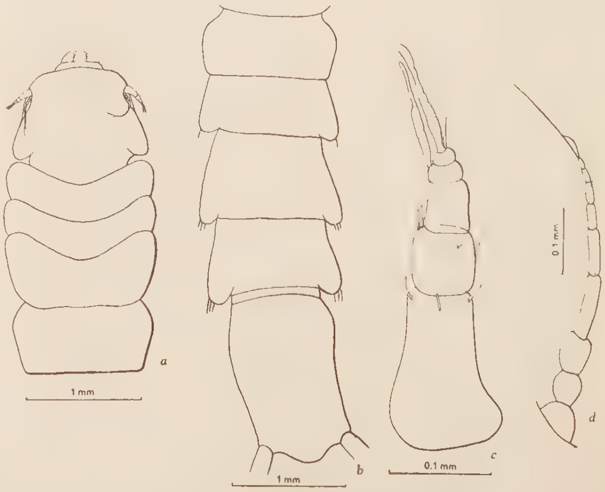

Fig. 14. *Macrostylis galatheae* n.sp.; a, dorsal view of head and pereion somites 1-4 of ? male; b, dorsal view of pereion somites 4-7 and pleon of female; c, antenna 1; d, antenna 2.

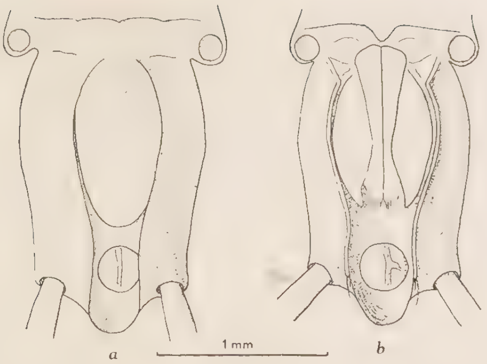

Fig. 15. *Macrostylis galatheae* n.sp.; a, abdomen of female from below; b, abdomen of male from below.

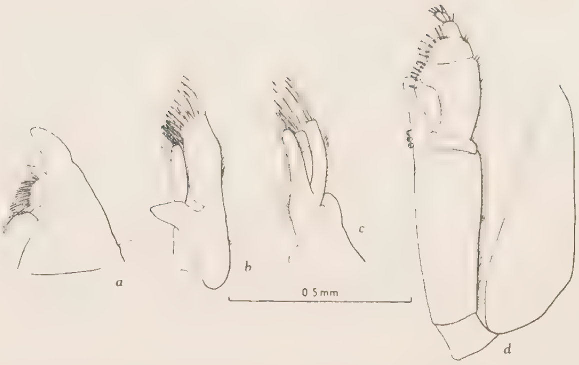

Fig. 16. *Macrostylis galatheae* n.sp.; a, left mandible; b-c, left maxillae 1 and 2; d, left maxilliped.

cies. – Only about three fifths of the narrow, ventral excavation is covered by the female or the male operculum. Almost in the middle of the uncovered, distal part of the excavation the two anal doors are visible. The excavation is broader in the male than in the female and lined with a conspicuous seam, ending off the anal doors and at the termination furnished with a short and a longer seta.

Antenna 1 (fig. 14c) moderately long, with 5 segments, the first of them being a little longer than the remaining four together. Segments 4 and 5 very small and each with a stout olfactory filament. I regard the present, broken specimen as a male, because the first antenna has the same number of segments and placement of the sensory filaments as the first antenna of the male of *M. hadalis,* the most closely related species (see p. 104).

Antenna 2 (fig. 14d) unusually short, being not half the length of the head. First three segments subequal in size, rounded. The remaining six segments cylindrical, decreasing in length and width towards the sixth which is furnished with one rather long and one very long seta.

Left mandible (fig. 16a) rather different from that of *M. spinifera,* the only species in which the mandibles of this genus was hitherto described (by Sars 1899, pl. 51). It is very short and broad and has a blunt cutting edge. The movable lacinia is slender and has two teeth as in *spinifera.* There are a great many spines and setae in the spine-row, at least 25. The molar process is still smaller than in *spinifera* and almost triangular; it has only two setae.

Maxillae 1 and 2 (fig. 16b & c) of almost the same shape as in *spinifera.*

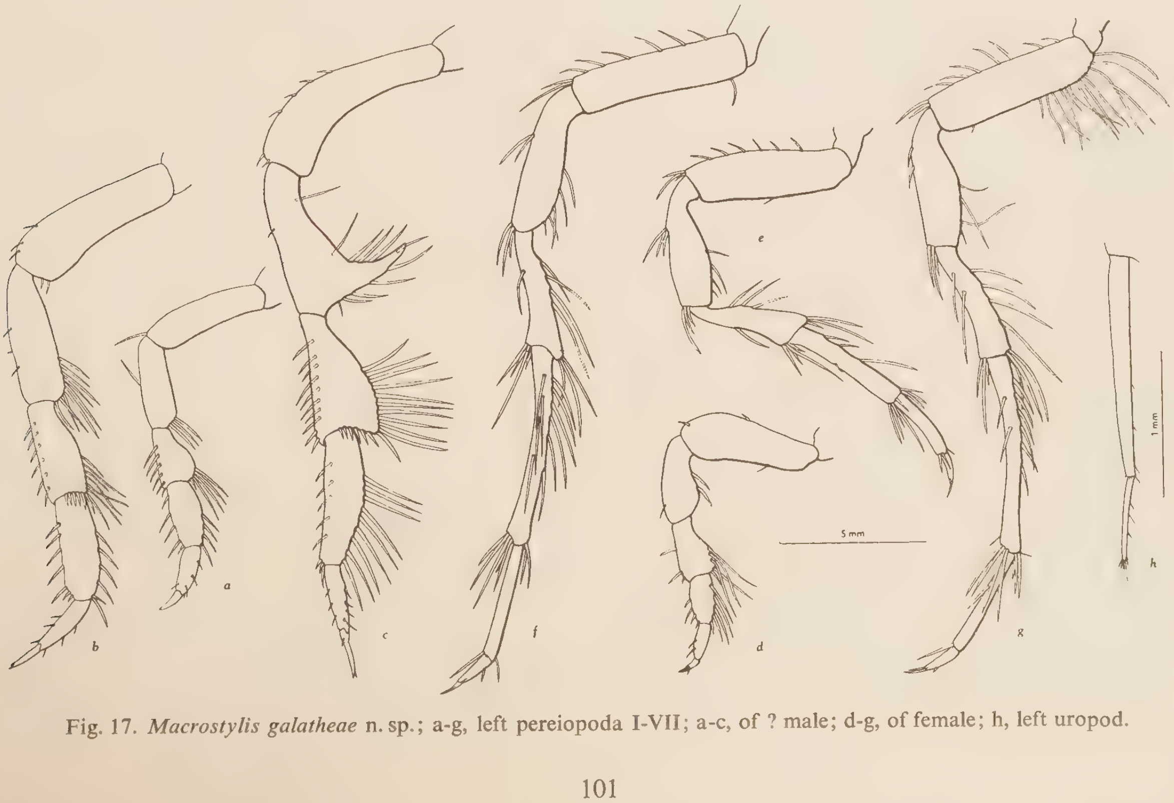

Fig. 17. *Macrostylis galatheae* n. sp.; a-g, left pereiopoda I-VII; a-c, of ? male; d-g, of female; h, left uropod.

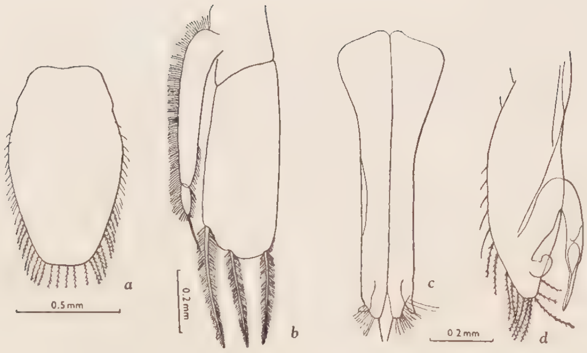

Fig. 18. *Macrostylis galatheae* n. sp.; a, female operculum; b, pleopod 3 of female; c, male pleopoda 1; d, pleopod 2 of male.

Maxilliped (fig. 16d) more slender than in *spinifera* and *subinermis*, the second segment being three times longer than broad instead of about two and a half times. In the diagnosis of the genus SARS states that the two distal segments of the palp are rudimentary; this is, however, neither the case in *subinermis* (HANSEN 1916, pl. 7, fig. 4c) nor in the present species. There are three coupling hooks.

Pereiopods I and II (fig. 17a & b) subequal in shape, except for the merus, which is broadened in pereiopod I. Also the furnishment with setae is similar, but there are about twice as many in II. The size of I is about three fifths of II.

Pereiopod III (fig. 17c) is one sixth longer than II and has the ischium and merus extended laterally. Beyond the middle of ischium is on the upper (inner) margin a strong, recurved, spiniform process, even stouter than in *M. spinifera,* and replacing the strong spine found in the same place in most of the other species. Along the upper margin of merus and carpus are rows of long and robust setae.

Pereiopod IV (fig. 17d) is only half as long as III.

Pereiopods V-VII (fig. 17e-g) are long and much more slender than the anterior legs. They are furnished with a great many more or less robust setae; basis of VII has besides a row of long and thin hairs.

Female operculum (fig. 18a) is relatively much shorter than in all other *Macrostylis* species, except *abyssicola.* It is oblong ovate with the distal end somewhat cut off. It is almost twice as long as broad and has a low median keel stretching from the proximal part to the middle of the operculum (fig. 15a).

Pleopod 3 of female (fig. 18b) is much more slender than in *spinifera,* and the outer ramus has a second segment, terminating in one seta.

Male operculum is also short. The first pair of pleopods (fig. 18c) very long and slender and broadest at base. On the apex there is an outer, shorter, and narrower lobe and an inner, longer, and broader lobe; the latter is furnished with a row of setae. *Pleopod 2* (fig. 18d) is not quite so narrow as in *spinifera* and *longipes* and has a rounded apex. The copulatory organ is short and stout, reaching only a little beyond the apex.

Uropod of male (fig. 17h) is somewhat longer than the pleon. It has two segments, the proximal being almost twice as long as the distal, which terminates in a few setae. Uropod of female not preserved.

Size: Total length about 5.5 mm.

Remarks:

As will appear from the key given above *M. galathea* is well separated from the rest of the *Macrostylis* species (affinity to *M. hadalis* will be discussed under that species). Apart from *hadalis* it seems to be most closely related to those two species of the genus which till now were known from the greatest depths, viz. *abyssicola* and *latifrons* (both from about 3500 m). Besides the differences pointed out in the key a few more can be given. For *abyssicola:* Postero-lateral corners of head sharp (instead of rounded in *galathea);* antenna 1 with three segments (instead of five) and considerably shorter; female operculum with a regularly rounded, distal end in *abyssicola.*

Concerning *M. latifrons* a comparison has been difficult and not quite satisfying. BEDDARD's description (1886, p. 173) was based on a single female from the Challenger and is not very exhaustive; his figure is without any value at all.

During a recent visit to the British Museum (Natural History) in London I had an opportunity to examine the holotype of *latifrons* which is the only specimen known. Unfortunately, it was mounted on a slide and had suffered so badly from the process that it cannot be unmounted any more. It therefore seems impossible to give a quite satisfying revision of BEDDARD's description. It is very regrettable that it cannot be stated for instance whether or not there is a process on the ventral side of pereion somite 1 and a keel on the succeeding ones, whether somite 2 really has parallel anterior and posterior margins (as claimed by BEDDARD), and what the under side of pleon looks like.

M. latifrons is relatively broader than *galatheae.* I found it 4.7 times as long as wide while *galatheae* is at least 5.5 times longer than wide.

The head of *latifrons* is very cracked, but the po-

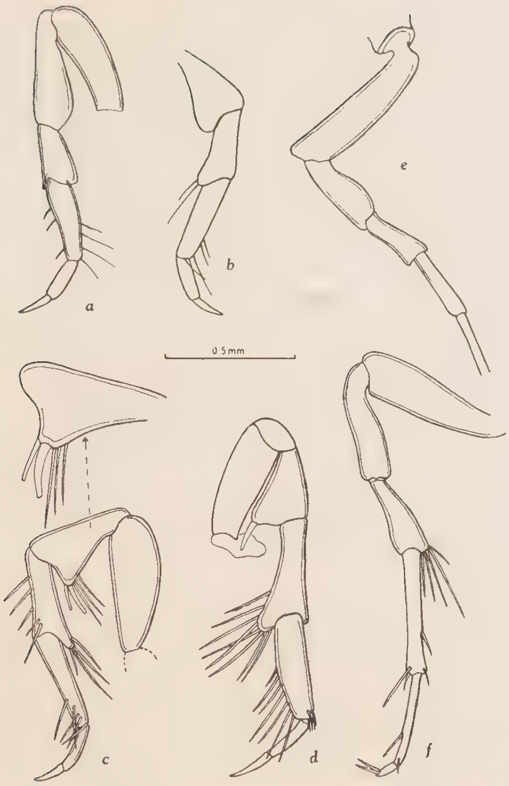

Fig. 19. *Macrostylis latifrons* Beddard; a-b, left and right pereiopod II; c-d, left and right pereiopod III; e, left pereiopod V; f, left pereiopod VI. Some setae omitted.

stero-lateral corners are intact and are at least as rounded as in *galatheae*. The head seems to be somewhat narrower than the three succeeding thoracic somites. One antenna 1 is visible and resembles that of *galatheae* but the first segment seems to be shorter (only about three fourths of the succeeding four segments). The equipment with olfactory filaments is rather obscure. There seems to be one stout, terminal filament and a short terminal seta as in *galathea,* while the subterminal olfactory filament of the latter species apparently is lacking in *latifrons*. This difference may be due to the fact that the two specimens are probably not the same sex.

Four of the pereiopods were sufficiently exposed to be drawn. In some of the figures the setae are totally or partly omitted since they were very obscure.

Pereiopod II (fig. 19a & b) does not differ very much from that of *galatheae* except for a marked process on the distal, outer corner of merus, visible both on the right and the left, second pereiopod of the type specimen. Besides, carpus is comparatively longer in *latifrons*.

Pereiopod III (fig. 19c & d). One of the greatest differences between *latifrons* and *galatheae* is found in the shape of ischium of this leg. The latter is described above. The former is triangular and furnished with one stout and one somewhat shorter and thinner spine on the distal, inner corner. Both spines have the distal end rounded or even truncate. These spines are probably very little calcified, since they are quite difficult to focus on the slide. Basis of pereiopod III is also comparatively shorter and broader in *latifrons,* and merus is distinctly broader at the proximal and narrower at the distal end than in *galatheae*.

Pereiopod V (fig. 19e) has a very long basis as mentioned in the key. Moreover, it has a projection on the distal, outer corner, which is absent in *galatheae*.

I found the operculum extremely broken. It could, however, be made out that the specimen is a female, and that the operculum is definitely broader than in *galatheae*.

Although the only specimen existing of *M. latifrons* is so badly preserved there is, however, hardly any doubt that sufficiently many characters indicate that *latifrons* and *galatheae* must be two distinct species.

Distribution:

M. galatheae is known only from the type locality in the Philippine Trench at a depth of 9790 m, being thus the deepest isopod find ever recorded. Together with a single specimen of an amphipod from Galathea St. 418 (10.190 m) this species is so far the only crustacean which has been dredged at depths of about 10.000 m.

Macrostylis hadalis n. sp.

Material:

St. 496, Banda Trench (05°36′S, 131°06′E), 7280 m, 23. Sept. 1951. Gear: Petersen grab (bottom sampler) 0.2 sq.m. Bottom: soft clay. Bottom temperature: 3.6°C. – 1 female and 1 male. The female is the type specimen.

Description:

Body (fig. 20a & b) more elongated than in any other species of *Macrostylis,* being six times longer than broad. The margins are subparallel, the width being almost uniform from first pereion somite to end of pleon.

Head almost semicircular, considerably more rounded than in *galatheae*. It has the same marked constriction posteriorly as this species.

Pereion somites 1-3 immovably coalesced. Seen from above they have the same general shape as in

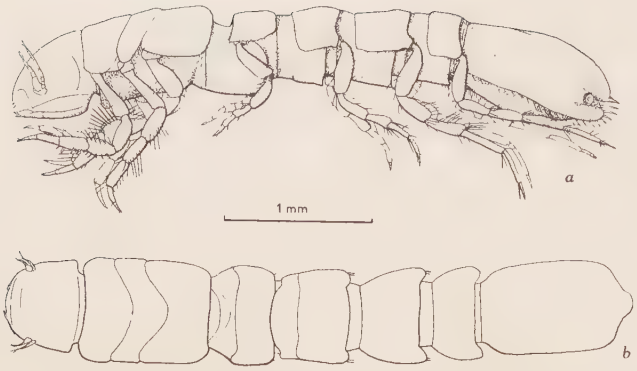

Fig. 20. *Macrostylis hadalis* n. sp. ♀; type specimen from the Banda Trench 7280 m; a, lateral view; b, dorsal view.

galatheae, but they are comparatively longer, being together one sixth longer than broad, while in *galatheae* they are a little broader than long. The anterior margin of the first somite is also straight, not concave as in *galatheae*. The three somites are exactly as in *subinermis* (Hansen 1916, pl. 7, fig. 4a). Seen from the side the lateral margin in *galatheae* is almost straight (fig. 13), while in *hadalis* somite 1 reaches furthest down towards the ventral side, somite 2 becomes quite narrow, and somite 3 is considerably shorter than especially 1 (fig. 20a). Ventrally the anterior part of the first somite is considerably deeper than the posterior end of the head.

Pereion somites 4-7 look as if they had been stretched dorsally, since the strongly calcified dorsal plates are much smaller than the entire somites. However, the ventral integument shows no sign of molestation at all, so the present outlook must be considered the normal one; I also prepared the figure of *hadalis* in dorsal view after having mounted the specimen on a slide so that it was perfectly straight. As in *galatheae* the postero-lateral corners of somites 5-7 are rounded and vaulted, but their equipment with spines is somewhat different. There is also a considerable difference in the relative length of somites 4-7, when seen in dorsal view. In *galatheae* 6 is definitely the longest and 7 the longest but one. In *hadalis* somites 5 and 6 are about equally long and 7 is shorter than any of the three preceding somites.

Ventrally the anterior three fourths of each of the somites 4-7 is somewhat raised compared with the remaining fourth of the somite. Thus, on each somite a conspicuous notch is formed. Moreover, the median part of the raised area is slightly keeled and ends posteriorly in a tiny spine which corresponds to the stout ventral, backwards curved spines found in almost all the northern species of the genus.

Pleon somewhat less than twice as long as broad and somewhat longer than the two preceding somites together. The general shape is like that of *galatheae;* nor in this species are the peculiar organs, mentioned by Hansen, visible. – The excavation on the ventral side of pleon is narrow (broadest in the male) and only three fifths of it is covered by the female and the male operculum (fig. 21a). In both sexes the margin between the ventral surface of pleon and the excavation curves forwards and upwards near the distal end. The proximal part of the margin is furnished with setae, while the distal bend has a row of strong spines. The roof of the excavation forms a projection which reaches further backwards than the above lying part of the pleon, thus looking almost like the upper "beak" of a dolphin (fig. 20a).

Antenna 1 of female (fig. 21b) moderately long, with four segments of which the proximal is very large and longer than the other three together. There is only one stout olfactory filament terminally. The male antenna 1 has five segments of which the third and the fourth are equally broad, and the former twice as long as the latter. There are two subterminal and two terminal olfactory filaments which are all of the same length.

Antenna 2 (fig. 21b) almost as short as in *gala-*

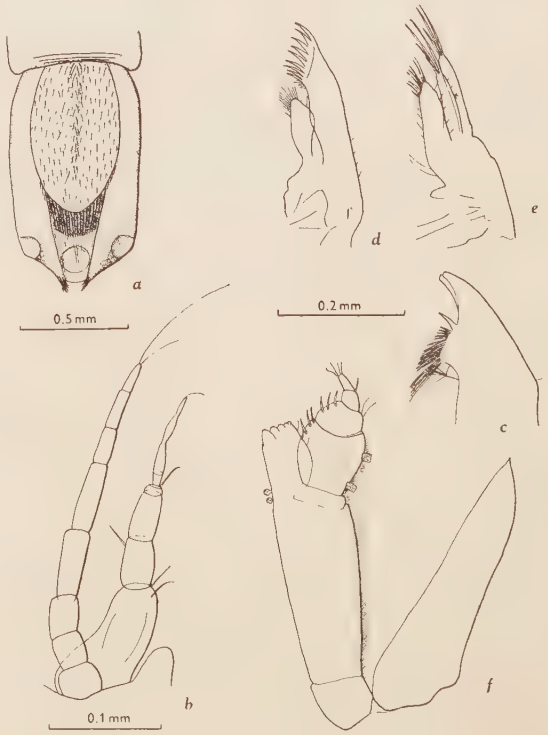

Fig. 21. *Macrostylis hadalis* n. sp. ♀; a, pleon from below; b, antenna 1 (to the right), antenna 2 (to the left); c, left mandible; d-e, left maxillae 1 and 2; f, left maxilliped.

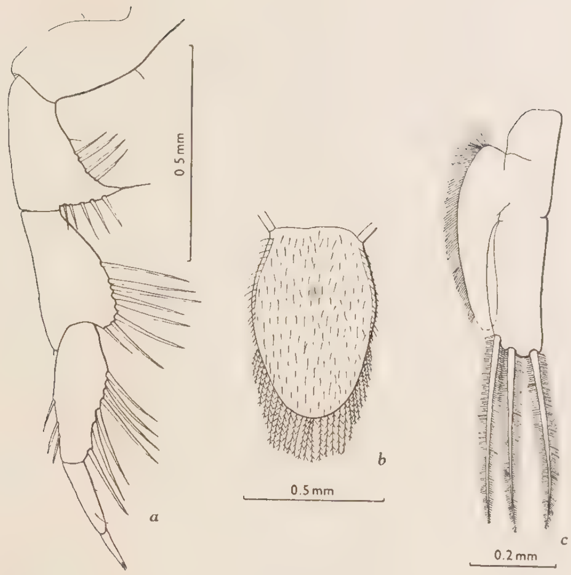

Fig. 22. *Macrostylis hadalis* n. sp. ♀; a, pereiopod III; b, operculum; c, pleopod 3.

theae, being only a little more than half the length of the head. The shape of the antenna is also similar in the two species, except that *hadalis* has only three segments in the flagellum in both sexes.

Left mandible (fig. 21 c) shaped almost as in *galatheae.* The only differences are that it is a little more slender, has a double-toothed cutting edge, a single-toothed movable lacinia, and five fine setae on the triangular molar process.

Maxillae 1 and 2 (fig. 21 d & e) similar to those of *galatheae,* except that maxilla 1 has fewer spines.

Maxilliped (fig. 21 f) is not quite so slender as in *galatheae.* This does not, however, hold good for the epipodite which is distinctly narrower and hyaline along the outer margin. There are only two coupling hooks.

Pereiopods I and II (fig. 20 a) are equally long. In both legs basis is relatively longer and ischium relatively shorter than in *galatheae.*

Pereiopod III (fig. 22 a) has rather broad segments, especially ischium which is almost triangular with straight margins, and the spiniform process on the upper (inner) margin is much less pronounced than in *galatheae.* The armament with long and robust setae is almost the same in the two species.

Pereiopods IV-VII (fig. 20 a) are almost equal both in shape and relative length in the two species. The only major differences are that basis of all four legs is somewhat broader in *hadalis* and carpus of pereiopods VI and VII relatively longer in *galatheae.*

Female operculum (fig. 22 b) is ovate and a little less than one and a half times longer than broad. The rounded distal margin is furnished with rather long, feathered setae, and the lower surface covered with a great number of short hairs. There is a low, median keel, stretching from the base almost to the distal end (fig. 21 a).

Pleopod 3 of female (fig. 22 c) is slender and the three terminal, feathered setae are very long, even longer than the second segment. The tip of the outer ramus was broken off, but apparently the ramus does not have two segments as in *galatheae.*

Male pleopoda 1 (fig. 23 a) are extremely slender and have the outer, distal lobe longer than the inner one which bears a few setae. The pleopods are somewhat excavated dorsally; almost halfway between the apex and base the raised lateral margins bend inwards and run towards the base as a pair of low keels in the same way as on the dorsal surface of the first pair of male pleopods in *Ischnomesus spärcki* (fig. 11 a, p. 97).

Male pleopod 2 (fig. 23 b) is broader than in *galatheae,* and the inner margin is slightly concave instead of convex. The copulatory organ is also much shorter, reaching only a little beyond the coupling hook.

Uropod (fig. 23 c) was only preserved on the left side of the male. It is, as far as could be made out, with one segment only; even at the greatest magnification it was impossible to find any articulation. Moreover, the uropod is only two fifths of the length of pleon, i. e. even shorter than in *subinermis.* Along both margins it is furnished with some very long and partly feathered setae.

Size: The total length of the female is 4.4 mm, and the largest width 0.7 mm. The male is 4.6 mm long.

Variation:

Apart from the sexual dimorphism in shape of the first pair of antennae, the pleopods, and the excavation of the ventral part of pleon there are no differences between the present two specimens.

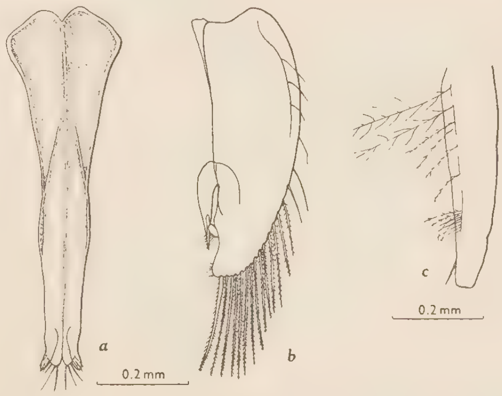

Fig. 23. *Macrostylis hadalis* n. sp. ♂; a, pleopoda 1 from inside (dorsal view); b, pleopod 2; c, uropod.

Remarks:

Disregarding the very imperfect *M. latifrons* Bedd. there is hardly any doubt that *galatheae* and *hadalis*, so far two of the deepest recorded species of Isopoda, are very closely related. They agree in several main characters such as general shape, lack of armament with strong spines on the ventral side of the pereion somites, shape of pleon and narrowness of its ventral excavation which in both species is only partly covered by the opercula, shape of antenna 1 and mandible, length of antenna 2, and, finally, presence of two pairs of lobes on the distal end of the male pleopoda.

On the other hand, it is possible to point out a great many differences, several of which are essential enough to justify the separation into two distinct species. A brief summary of the major differences may be useful; the characters of *hadalis* are mentioned first in each heading:

Head semicircular instead of almost squarish; somites 1-3 longer than broad, their lateral margins (seen from the side) irregular instead of straight, and anterior margin of somite 1 straight, not concave; somites 5 and 6 longest and 7 shortest in *hadalis* while somite 6 is the longest and 7 the longest but one in *galatheae;* part of the ventral side of somites 4-7 raised and slightly keeled in *hadalis* which has also a rather complicated termination of the excavation on the ventral side of pleon, not found in *galatheae;* antenna 2 has eight segments instead of nine, and there are two close, blunt teeth on the cutting edge of the mandible instead of one; pereiopod I is as long as II, and ischium of pereiopod III is differently shaped; the female operculum is rounded posteriorly and covered with a great many short hairs instead of being cut off posteriorly and naked; outer, distal lobes of male pleopoda 1 longer than inner lobes, and plp. 2 with much shorter copulatory organ; finally, the uropod has only one segment and is less than half as long as pleon.

Like *galatheae*, also *hadalis* resembles *latifrons* in some of the few characters which it is still possible to study on the single, poor specimen of that species. In shape of pereiopod III *hadalis* resembles *latifrons* even more than does *galatheae*. However, *hadalis* has only a thin seta on the inner, distal corner of ischium instead of the two thick, blunt spines in *latifrons*, and merus is much broader in *hadalis*.

Distribution:

So far known only from the Banda Trench west of New Guinea, at 7280 m and 3.6°C.

Ilyarachnini Hansen

Ilyarachna G. O. Sars

Mesostenus G. O. Sars, 1864, p. 211
Ilyarachna G. O. Sars, 1869, p. 44
Ilyarachna G. O. Sars, 1899, p. 134
Echinozone G. O. Sars, 1899, p. 139
Aspidarachna G. O. Sars, 1899, p. 140
Ilyarachna G. O. Sars, HANSEN 1916, p. 121
Echinozone G. O. Sars, HANSEN 1916, p. 128
Aspidarachna G. O. Sars, HANSEN, 1916, p. 128
Ilyarachna G. O. Sars, HULT 1936 a, p. 12
Echinozone G. O. Sars, HULT 1936 a, p. 12
Aspidarachna G. O. Sars, HULT 1936 a, p. 12

HANSEN was the first to point out that the three genera *Ilyarachna, Echinozone,* and *Aspidarachna* were probably identical, and in 1936 HULT made the final cancellation of the two latter genera. Thus, the group Ilyarachnini now comprises two genera only, *Pseudarachna* G. O. Sars 1899 with one species and *Ilyarachna* with 18 valid species, namely: *I. abyssorum* Richardson 1911, *affinis* and *crassiceps* Barnard 1920, *antarctica, aries,* and *magnifica* Vanhöffen 1914, *arctica, bicornis, dubia,* and *spinosissima* Hansen 1916, *bergendali* Ohlin 1901, *longicornis* G. O. Sars 1864, *clypeata* and *coronata* G. O. Sars 1869, *quadrispinosa* Beddard 1886, and *starokadomskii* and *zachsi* Gurjanova 1933. Furthermore, I have transferred *Eurycope fusiformis* Barnard 1920 to this genus – see p. 123.

Ilyarachna antarctica Vanhöffen, 1914

Ilyarachna antarctica Vanhöffen, 1914, p. 591, fig. 124 a & b.
Ilyarachna antarctica Vanhöffen, NORDENSTAM 1933, p. 265, fig. 76 a-e.

Material:

St. 651, Kermadec Trench (32°10'S,177°14'W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 1 complete but broken female + 1 female with mutilated somite 7 and pleotelson + posterior half of 1 female; 1 complete male + anterior half of 1 male.

St. 658, Kermadec Trench (35°51'S,178°31'W), 6660-6720 m, 20. Febr. 1952. Gear: 6 m sledge trawl. Bottom: brown sand with clay and stones. Bottom temp.: 1.3°C. – 1 complete male + posterior half of 1 male.

St. 664, Kermadec Trench (36°34′S,178°57′W), 4510-4570 m, 24. Febr. 1952. Gear: herring otter trawl. Bottom: brown sandy clay with pumice. Bottom temp.: 1.1°C. – 1 complete, but somewhat mutilated, female.

Even if most of the specimens from the Galathea are more than twice as big as the largest, previously known specimens of *I. antarctica,* they must belong to the present species. This could hardly be decided alone by a comparison with the very short description and the figures given by VANHÖFFEN; but through the courtesy of Dr. J.-G. HELMCKE and Dr. H.-E. GRUNER of the Berlin Museum, I have been able to compare VANHÖFFEN's three type specimens with the present material from the Galathea. Moreover, the Swedish Antarctic Expedition also took this species, and NORDENSTAM has given a detailed description and good figures of antennae, mouthparts and pleopods. Through the courtesy of Professor K. LANG I have also been able to examine the five specimens caught by the Swedish Expedition and kept in the Riksmuseum, Stockholm.

Since neither VANHÖFFEN nor NORDENSTAM have given a full description of this interesting species it is described in detail below. For the sake of convenience the type and the other specimens from the German South Pole Expedition (described by VANHÖFFEN) are called the Gauss specimens (caught near the Gauss-station), the material from the Swedish Expedition is named the S. Georgia specimens, and the present collection from the Galathea the Kermadec specimens.

Type material:

According to VANHÖFFEN (1914, p. 591) the Gauss collected three specimens. One of them was 6 mm long, 2 mm broad and caught 30. March 1903 at a depth of 3397 m. The other two were 5.5 and 3.5 mm long, caught 3. April 1903 at 3423 m depth.

By an examination of the material I found that all three of them were females. The largest specimen is actually 6.3 mm long and 2.1 mm wide, the medium one 5.6 mm and the small one 3.2 mm long. Unfortunately, there is a disagreement between VANHÖFFEN's statement and the labelling, since the two large specimens were both labelled "3 IV 03, 3423 m" while the small one had no label at all. It seems most likely that the labels were exchanged after VANHÖFFEN published his report.

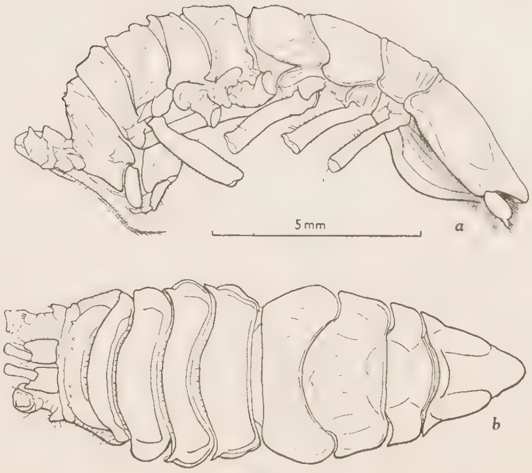

Fig. 24. *Ilyarachna antarctica* Vanhöffen; ♂ from St. 651 (Kermadec Trench, 7000 m); a, lateral view; b, dorsal view.

I have chosen the largest specimen as lectotype. It is the one figured from the left side in VANHÖFFEN's fig. 124 b. Fig. 124 a shows the other large female seen from above. They can be distinguished by means of the number of pereiopods still left and the number of spines on the head.

Description:

Body (fig. 24 a & b) rather oblong, 3.4 times longer than broad, and fairly strongly curved.

Head (fig. 25 and VANHÖFFEN's fig. 124 a, b) posteriorly broader than the first somite. Most of it is covered with a pair of oval, vaulted areas, the surface of which has a peculiar, net-like pattern like that of a giraffe. On the vaulted areas there are on each side one or two rows of robust, conical protuberances, each furnished with a translucent spine. Their numbers vary not only within the sexes, but also from one specimen to another. In the type specimen and one of the other Gauss females there is 1 spine on each side, the third Gauss female has 3 on each side; two of the females from Kermadec

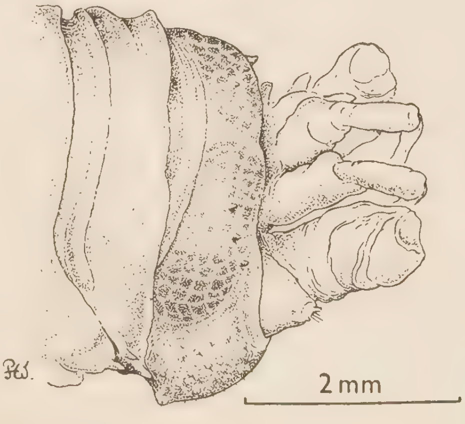

Fig. 25. *Ilyarachna antarctica* Vanhöffen; head of male with probable rudiment of eye.

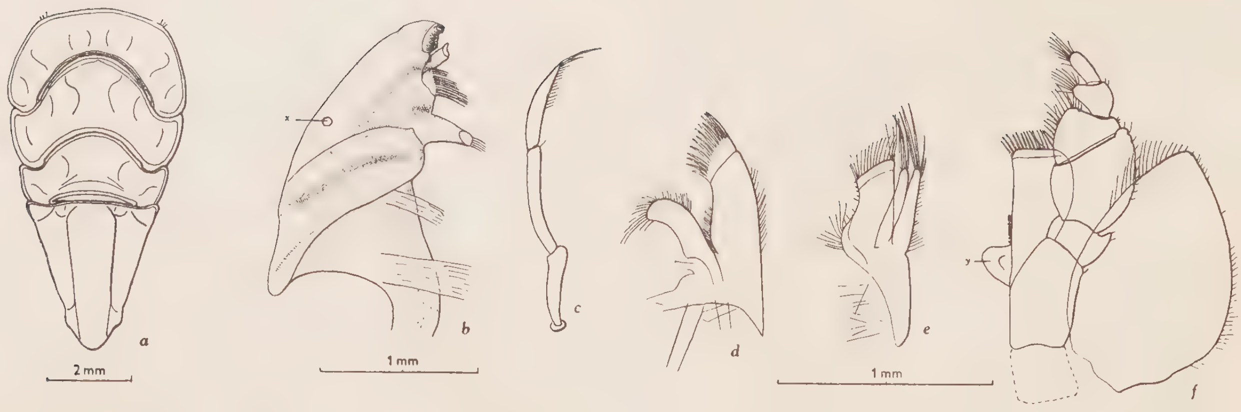

Fig. 26. *Ilyarachna antarctica* Vanhöffen; a, three posterior pereion somites and pleon, seen directly from above; b, left mandible (x, insertion of the palp); c, palp of left mandible; d-e, left maxillae 1 and 2; f, left maxilliped; the rounded plate (y) has been forced inwards.

have also 1 spine only, the third (from 4500 m) has 1 large and 1 smaller while two of the S. Georgia females have 5 (in two rows), and the third female has even 10 (two rows) on each side. On the other hand, the two males from S. Georgia have only 1 spine each, one of the Kermadec males has only 1, the second has 2-3 (two rows), and the third has 3 spines (fig. 25) on each side of the head. Thus, the number of spines on the head can by no means be reckoned as a specific character which has previously been the case.

The side-part of the head is somewhat vaulted, and in the Gauss and the Kermadec specimens furnished with many tiny protuberances, each with a short hair.

Pereion somites 1-4 increase in width from 1 to 3 which is the broadest. Length of somite 1 is a little more than half the length of 4; somites 2 and 3 are equally long, a little longer than 1 and shorter than 4. All somites have a low, transverse keel along the anterior and posterior margin.

The side-parts of somite 1 decrease in width; on the rounded end there is a short, conical process. The antero-lateral corners of somite 2 are rounded. In the Kermadec specimens the antero-lateral corners of somite 3 have a broad, almost squarish process with a minute spine which is missing in the Gauss and S. Georgia specimens. All specimens have a marked process on the antero-lateral corner of somite 4; in the Kermadec specimens it is very strong and rather pointed (fig. 24 b).

First and second epimera of the Kermadec and the Gauss specimens with a conical, fairly strong process which is missing in the material from S. Georgia. The two following epimera have in all cases a characteristic, rounded keel along the anterior and upper margin.

On the anterior margins of somites 1-4 there is a row of very minute spines which are difficult to count. In the Kermadec specimens there are about twenty-five on somite 1, twenty on 2, fifteen on 3, and ten on 4. In the Gauss and S. Georgia specimens there are only about half as many on each somite. They are not nearly so strong as shown in VANHÖFFEN's figure.

Pereion somites 5-7 (fig. 26 a) are slightly decreasing in width. Somite 6 is much longer than 5 and a good deal longer than 7. The antero-lateral corners of 6 and 7 have a rounded lobe which covers the posterior corner of the preceding somite and are furnished with hairs in the Gauss and the S. Georgia specimens. This lobe is missing in the Kermadec specimen from 4500 m. There are no spines on the anterior margins, nor on any of the epimera.

Pleon consists of two somites of which the anterior is narrow and very short. The second is as long as pereion somites 6 + 7 and is only a little narrower at the base than somite 7. The shape is triangular with the anterior margin almost straight. The lateral margins are straight except for a convexity above the insertion of the uropods. The apex is subacute. The median part of pleotelson is raised as a longitudinal convexity, continuing right to the end of the apex (not very pronounced in the S. Georgia males). Also the lateral parts are vaulted; in the Gauss and the Kermadec specimens they are separated from the slightly convex anterior corners of the pleotelson by an oblique, transverse furrow.

The vaulted lateral parts continue round on the ventral side of the pleon and are separated from the ventral cavity by a keel which grows narrower and finally disappears towards the insertion of the uropods (fig. 27a). The inner margin of the keel has a row of closely set, long hairs, and there is another, shorter row of hairs on the median, anterior part of the keel.

Antenna 1 (fig. 27 b & c and NORDENSTAM'S fig. 76a). The first segment is broad, almost squarish in shape. The outer, distal corner is triangularly produced and furnished with one or two small spines and a feathered seta at the tip. Inner corner with one spine and a similar seta. Lateral margin has a row of setae which may be two-pointed (Gauss and S. Georgia specimens). Second segment is much smaller than the first; in the male it is proportionately stouter than in the female. Third segment longer than second, fourth very short. The flagellum has a varying number of segments in specimens from the three localities: Gauss and Kermadec ♀♀: 5; S. Georgia ♀♀: 8-10; Kermadec ♂♂: about 35; S. Georgia ♂♂: 9-10 segments.

Antenna 2 is broken off at the distal end of the fourth segment except in one ovigerous female in the S. Georgia collection. The first four segments are very short. The prominent outer corner of the first segment has one or two spines, the outer margin of the third one spine. The squama on the third segment is small but distinct (fig. 24b). Segment 5 (S. Georgia) is slender and more than twice as long as the first four segments together; it is sparsely provided with small hairs. Segment 6 is twice as long as 5 and almost smooth. The flagellum consists of 36 segments. The whole antenna 2 attains a length of somewhat more than twice the length of the whole animal.

Mandible (fig. 26b) of the usual type in the genus. On the anterior side of the mandible corpus there is a somewhat bright-golden carina. The cutting edge is rounded and strongly chitinized. On the left mandible there is a well developed, movable lacinia; it has previously been mentioned only in one species of *Ilyarachna (I. spinosissima)*. The spine-row consists of seven spines in the S. Georgia, eight in the Gauss and about twelve in the Kermadec specimens. The molar process tapers conically towards the end which is furnished with three to five setae. In the palp the middle segment is the longest (fig. 26c). On the interior side of the last segment there is a row of short setae in the Kermadec specimens; it is not present in the Gauss specimens.

Maxillae are shown in figs. 26d & e. They are absolutely identical in all specimens studied.

Maxilliped (fig. 26f) is long and narrow. In the Gauss specimens there are four coupling-hooks on the right, five on the left side, while the S. Georgia animals have five and six, and the Kermadec specimens have nine and ten respectively. Epipodite obtusely pointed distally and only one and a half times longer than broad. Under the coupling hooks a rounded plate stands at right angles to the general plane of the maxilliped (y in fig. 26f).

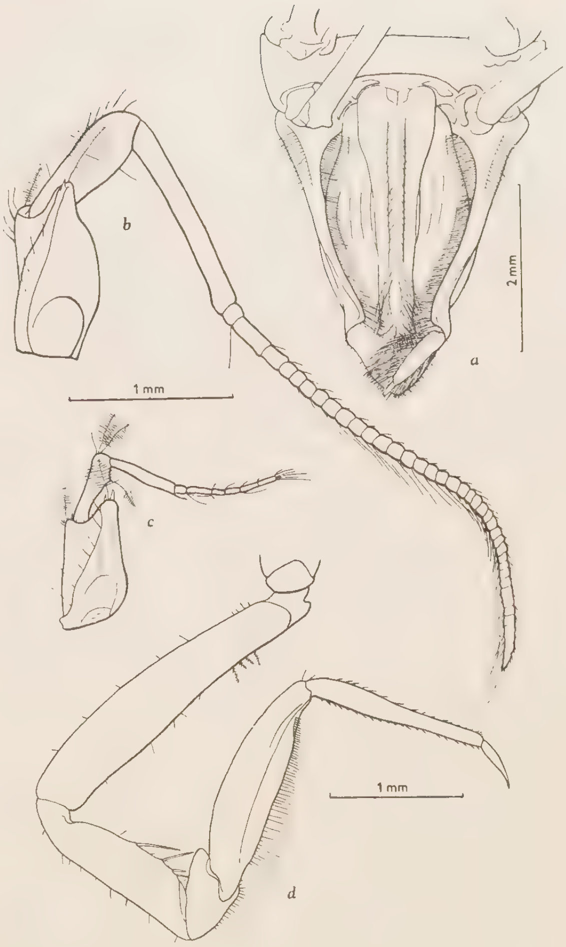

Fig. 27. *Ilyarachna antarctica* Vanhöffen; a, abdomen of male from below; b, right antenna 1 of male; c, right antenna 1 of female; d, pereipod I of male.

Pereiopod I (fig. 27d) short and rather stout, considerably stouter, however, in the Gauss and the Kermadec than in the S. Georgia specimens. Ischium of the latter is comparatively longer than in the Gauss and the Kermadec material (VANHÖFFEN'S fig. 124b not reliable in this respect). There are three (Kermadec) or seven (Gauss and S. Georgia) long spines along the anterior margin of ischium.

Pereiopod II was broken off beyond basis in all specimens except one from S. Georgia. Basis is a trifle longer than in pereiopod I. In the Kermadec and Gauss specimens it is five times, in the S. Georgia specimens less than four times as long as broad. Ischium in the said specimen has the same width as basis, but is a little shorter. Merus is about half

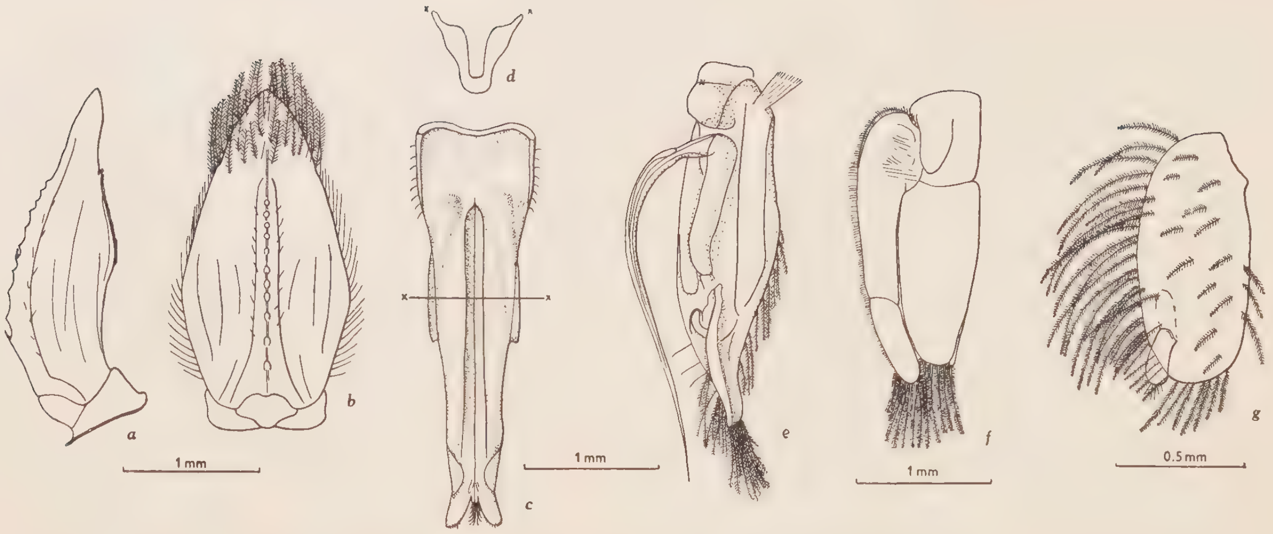

Fig. 28. *Ilyarachna antarctica* Vanhöffen; a, female operculum, lateral view; all setae have been omitted; b, female operculum from outside; c, male pleopoda 1; d, section of pleopoda 1 at x-x; e-f, male pleopoda 2 and 3; g, left uropod of male.

as long as ischium and somewhat narrower. Carpus is as long as the two preceding segments and 6-7 times as long as broad. Propodus somewhat narrower and as long as basis. The tip of dactylus is broken off, but the segment is at least two thirds of the preceding one. All segments except dactylus, with a great many, rather long setae.

Pereiopod III and IV have only basis preserved in all specimens. It is curved outwards and only about half the length of basis of pereiopod II. Vanhöffen figured basis of IV as if straight, but this is not the case.

Pereiopod V and VI (Vanhöffen's fig. 124b) are almost identical; the only difference is that carpus is as broad as long in V, while it is longer than broad in VI. Basis is one fifth longer than ischium which has a low convexity on the posterior margin which makes it less than three times as long as wide. Propodus is somewhat shorter than carpus. Dactylus is shorter than propodus in the type specimen, but longer in the S. Georgia material in which it is as long as carpus. Vanhöffen's figure of pereiopod V is correct except that the long swimming setae on ischium-propodus are feathered. In the Kermadec specimens V and VI are broken off.

Pereiopod VII is also missing in the Kermadec material. Basis is as long as in pereiopod VI, but only half as broad. Ischium a little longer than carpus; propodus longer than merus + carpus and shorter than basis; dactylus as long as ischium. All segments (except dactylus) with long and partly feathered setae.

Female operculum (fig. 28 a & b and Nordenstam's fig. 76d). Its shape is ovate, and it is convex both longitudinally and transversely. Along the middle line there is a sharp, longitudinal carina which only bears small, scattered hairs in the S. Georgia females, while the carina of the Gauss and Kermadec specimens is furnished with about 12 low tubercles, each with a spine which is mostly broken off. The lateral margins of the operculum have a row of closely set setae, while the distal end is covered with stout, feathered setae.

Male operculum is about twice as long as broad. There is a marked difference between the *first pair of pleopods* in the S. Georgia and in the Kermadec males (all Gauss specimens are unfortunately females). The former are "of almost uniform width" (Nordenstam's fig. 76b), but in the Kermadec males (fig. 28c) they are more than twice as wide at base as distally and strongly curved from base to end. From a place not far from the proximal end a very deep furrow runs along the dorsal (inner) side, continuing to the base of the coalesced endopodites; the furrow is especially deep in the middle part of the pleopods (see section in fig. 28d). The middle third of the lateral margins is shaped like a keel. Near the base of the somewhat backwards bent exopodites the lateral margins are furnished with a pair of inward bent, rather short, plaits which almost meet and close the inner side of the two pleopods; they are also found in the S. Georgia males.

On the outer (ventral) side of pleopoda 1 a very fine furrow is found along the median line where the pleopods are coalesced; on each side of the furrow there is a row of long, closely set setae.

Second pair of male pleopods (fig. 28e) are about four times as long as broad. On the dorsal (inner) side there is a high and narrow keel running from the base of the copulatory organ to the end of the apex which is furnished with many long and stout, feathered setae. The copulatory organ reaches a little beyond the apex; it is more slender in the S. Georgia males than shown by NORDENSTAM in his fig. 76 c. The pleopods of the Kermadec males are strongly calcified (except the copulatory organ).

Pleopods 3-5 of this genus were previously figured by BONNIER (1896, pl. 34 – *I. polita*), by SARS (1899, pl. 60 – *I. hirticeps* (= *longicornis*) and by NORDENSTAM (fig. 77 j & k – *I. quadrispinosa*). Pleopod 3 in the male of *antarctica* (fig. 28 f) has the basipodite longer than broad. The endopodite is more than twice as long as broad and with the distal end narrower than in *quadrispinosa*. The distal end is furnished with five feathered setae, while *polita* and *longicornis* have only three and *quadrispinosa* about twelve. The exopodite has about ten feathered setae on the tip, and a great many hairs along the outer, convex margin. Pleopod 4 is very much like that of *longicornis*, the only differences being that the two segments of the exopodite are almost equally long and a little narrower, and that the distal segment has about six feathered setae instead of four only in *longicornis*. Pleopod 5 is a broad rounded plate like the one figured by SARS for *longicornis* (pl. 60).

Uropod of female with almost straight outer margin, i. e. not convex as in NORDENSTAM'S figure. Uropod of male (fig. 28 g) with more than twice as many feathered setae as the female.

Size: Largest Gauss female: 6.3 mm long, 2.1 mm broad; largest S. Georgia female: 5.3 mm and largest male: 3.9 mm long; largest Kermadec female: 15.2 mm long, 4.5 mm broad and largest male: 8.7 mm long, 3.3 mm broad.

Eggs: Two of the S. Georgia females have eggs in the marsupium, each about 25. The size is about 0.3 × 0.2 mm. A few larvae have developed a short pleon which is bent under the body; the budding antennae 1 can be seen. The total length of these tiny larvae is 0.7 mm.

Variation:

Previously much attention was paid to the armament with spines on head within this genus. As will be seen above (p. 107) this character is highly variable, not only between males and females, but also within the same sex from the same population. Besides, the number of the mainly tiny spines along the anterior margin of somites 1-4 differ considerably both in this species and in others, such as *I. affinis* Barnard.

There is one difference in the present material which seems essential to me, i. e. the shape of the proximal part of pleopoda 1 in the males from Kermadec and those from S. Georgia. Since, however, the general appearance of this appendage is the same the said difference cannot be regarded as specific.

The variation in size is considerable, the largest antarctic females being 5.3 and 6.3 mm long, while the largest female from Kermadec is 15.2 mm. This difference is, however, not so big as that found within females of *Ilyarachna (Echinozone) quadrispinosa* (Beddard), even from the same area; according to NORDENSTAM (1933, p. 273) the largest females (all with marsupial plates) from four stations are: 4.7 – 8.3 – 9.7 and 17 mm long.

The careful examination of the total material of *I. antarctica* has of course revealed several differences of minor importance or of none at all. In a few cases there are differences between the specimens from all three localities (for instance number of coupling hooks in maxilliped and of spines in spine-row of mandible). Mainly the Gauss and the Kermadec specimens agree but differ from the S. Georgia material (e. g. spines and protuberances on head, epimera of somites 1 and 2, flagellum of antenna 1, and stoutness of pereiopod 1 as well as length of its ischium). Finally, the shape of somites 3 and 4 show the greatest resemblance between the Gauss and the S. Georgia specimens.

Remarks:

When comparing *antarctica* to the other species of this genus VANHÖFFEN stressed the difference in armament with spines on head and body. As shown above these characters are non-specific, but even without them there are sufficiently many peculiarities for the separation. The only species with which *antarctica* agrees in general appearance (shape of body and abdomen, length of somites, etc.) is *I. bicornis* Hansen. Moreover, the shape of and armament with spines on antennae 1 and 2 as well as on female operculum is quite equal. However, the fact that somite 2 in *bicornis* is the broadest somite and much broader than somite 5, as well as the absence of exopodite on the uropod clearly separates the two species.

Distribution:

South Georgia (252-310 m; 1.5°C); Antarctic Indian Ocean (65° S, 80° E; 3397 and 3423 m); Kermadec Trench (4510-7000 m; 1.1-1.3°C).

Eurycopini Hansen

Storthyngura Vanhöffen

Storthyngura Vanhöffen, 1914, p. 583
Storthyngura Vanhöffen, Hansen 1916, p. 132

This genus was erected by Vanhöffen (1914) to include all forms of *Eurycope* with a jagged pleon and with a more or less spiny body. Hansen (1916) added four more characters of greater generic value, but pointed out that having only personally seen two of the altogether nine species ranked within this new genus he could not feel absolutely sure about the validity of the said characters. The genus therefore needs revision, although it seems to be fairly well defined. As already pointed out by Hansen many years ago, especially the Challenger and the Albatross material should be revised.

The nine species which according to our present knowledge belong to *Storthyngura* are: *S. novaezelandiae* (Bedd.), *S. fragilis* (Bedd.), *S. atlantica* (Bedd.) *S. intermedia* (Bedd.), *S. pulchra* (Hansen), *S. truncata* (Rich.), *S. magnispinis* (Rich.), *S. elegans* Vanhöffen, and *S. robustissima* Monod. *Storthyngura caribbea* (Benedict) is synonymous with *S. pulchra* (Hansen) (see below).

All the present specimens from the Galathea fit well within the limits of *Storthyngura,* as they are indicated by Hansen and definitely belong to this genus.

Besides, another species from the Challenger, *Eurycope spinosa* (Beddard 1886, p. 68) should be included, even if it is mutilated so that the posterior half of the animal is absent. During a visit to the British Museum (Natural History), London, I had an opportunity to examine the type specimen of *spinosa.* It was easy to see that the presence of spines and the unarticulated antennal scale (squama) places the species nearer to the genus *Storthyngura* than to *Eurycope*. The main difference between *spinosa* and the species belonging to *Storthyngura* is the exceedingly strong armament with spines. Not only are the spines which correspond to the dorsal and epimeral spines in the *Storthyngura* species much longer in *spinosa,* but on each of the somites present is a pair of equally long, dorso-lateral spines which are not found in any *Storthyngura* species. However, so long as only one incomplete specimen is known it would be absurd to establish a new genus. – It is not my intention to redescribe *spinosa* in this paper. I shall confine myself to point out that only one of the figures given by Beddard (pl. X, fig. 6-7) is nearly correct, viz. fig. 7, the side view of the animal. However, not even this figure is correct in all details. For instance the lateral spines on thoracic somites 1-3 are epimeral; there is no spine on the second segment of antenna 2; on the other hand there are three spines on the third segment, instead of one only in fig. 7. Finally, it should be stated that the type is a female with marsupial plates as in *S. benti* n. sp. (see below) and that the legs on the first four thoracic somites are present and exactly like those in other species of *Storthyngura.*

Finally, I found in one of the type specimens of *Storthyngura ("Eurycope") novae-zelandiae* (Beddard), kept in the British Museum, several embryos which are discussed on pp. 121-123, after the descriptions of the new species of *Storthyngura* from the Galathea.

Storthyngura benti n. sp.

Material:

St. 651, Kermadec Trench (32°10'S, 177°14'W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 10 complete females + anterior half of 8 and posterior half of 3 more females; anterior half of 2 males and posterior half of 2 males; 1 detorated marsupium.

St. 658, Kermadec Trench (35°51'S, 178°31'W), 6660-6720 m, 20. Febr. 1952. Gear: 6 m sledge trawl. Bottom: brown sand with clay and stones. Bottom temp.: 1.3°C. – 2 complete females, one with well developed marsupium; 2 complete males + anterior half of 1 male.

St. 650, Kermadec Trench (32°20'S, 176°54'W), 6620 m, 15. Febr. 1952. Gear: 6 m sledge trawl.

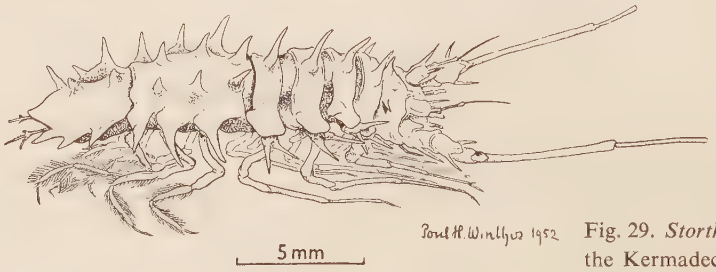

Fig. 29. *Storthyngura benti* n. sp., the Kermadec Trench, 7000 m.

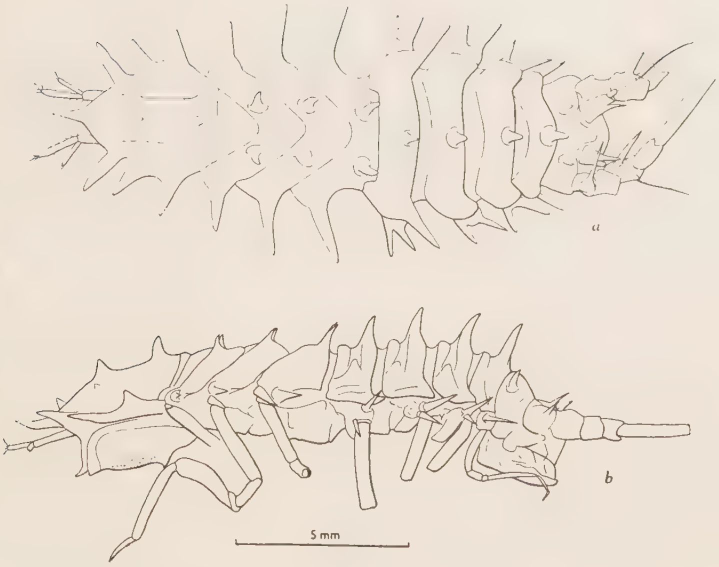

Fig. 30. *Storthyngura benti* n. sp.; ♀, type specimen; a, dorsal view; b, lateral view.

Bottom: brown clay with pumice. Bottom temp.: 1.3°C. – 1 female without pleotelson.

St. 654, Kermadec Trench (32°10′S, 175°54′W), 5850 m, 18. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temp.: 1.2°C. – 1 female with well developed marsupial plates.

St. 661, Kermadec Trench (36°07′S, 178°32′W), 5340 m, 23. Febr. 1952. Gear: 6 m sledge trawl. Bottom temp.: 1.1°C. – 1 juvenile female.

Type specimen:

A well preserved female from St. 651 was selected as type.

Description:

Body (figs. 29 & 30a-b) rather oblong, slightly convex, about three times as long as broad.

Head with a limited front area separated from the posterior part by a suture which forms a marked, forward pointing lobe between the first antennae. Behind this suture there are two comparatively short and slender, forward directed spines on each side of the median line.

Pereion somites 1-4 of the same general appearance, saddle-shaped, and each with a median, very high, acute dorsal spine, pointing obliquely forward and rising just behind the anterior margin. The first somite is shorter and narrower than the three succeeding ones; its antero-lateral angles are rounded and unarmed, but the epimera have a slender, outward and forward directed spine. Also in somites 2 and 3 the antero-lateral angles are unarmed, but in somite 4 they are furnished with a very strong acute spine turned outward and forward. Epimera of somites 2-4 each with two acute spines, of which the anterior is the longer, is directed somewhat outward, and is placed dorsally to the other spine. On the inner side of all epimera of somites 1-4 marsupial plates are found like those figured by STEPHENSEN 1947, p. 9, fig. 1, but only half as wide as long. One female from St. 658 has a fully developed marsupium with large, transparent, oblong-ovate plates.

Pereion somites 5-7 immovably coalesced and subequal in length and width. Each somite is vaulted both longitudinally and transversely and furnished with a pair of strong, forward directed spines, longest on the fifth, shortest on the seventh somite. The antero-lateral angles are produced into acute spines of which those on somite 5 are the longest and directed somewhat forward while those on somite 7 are the shortest and turned directly outward. All epimera unarmed.

Pleon (fig. 31 a) oval in shape. As in several other species two somites can be distinguished, the anterior being short and triangular. Just behind the furrow between the first somite and the rest of the pleon a rather short, stout, median spine, pointing slightly forward is situated. In the centre of the pleotelson there is another spine or process which is short and conical. Immediately posterior to it a small tubercle is situated on each side of the median line. Pleotelson has three lateral spines on each side. The middle ones are the shortest and are placed nearest to the hindmost spines which may have a slight expansion towards the base. All three lateral spines are directed outwards and a little backwards seen from above; a side view shows that the foremost and the hindmost are also directed somewhat

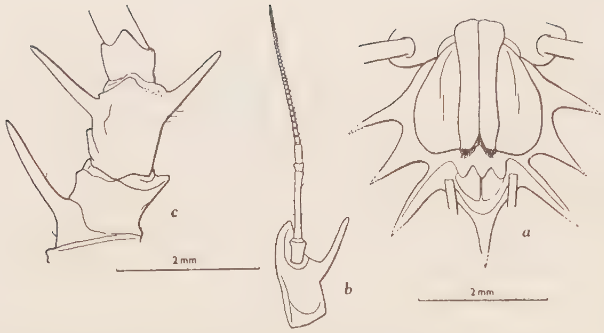

Fig. 31. *Storthyngura benti* n. sp.; a, pleon of male from below; b, dorso-lateral view of antenna 1 of female; c, dorsal view of peduncle of antenna 2 of female.

upwards. The median part of the pleotelson is raised as a longitudinal convexity, occupying somewhat more than one third of the width of the pleotelson and terminating a little in front of the hind margin of pleon.

On the ventral side of pleon (fig. 31 a) a conspicuous, arched keel connecting the underside of the two hindmost lateral spines separates the terminal face from the operculum. In the median part of this keel there is a crest with two or three projections bent downwards and backwards. In the middle of the terminal face, between the insertion of the uropods, the semicircular anal doors are seen.

Antenna 1 (fig. 31 b) reaches backwards to pereion somite 4 in the male, but only to somite 2 in the female. The first segment is twice as long as broad, with the distal outer part produced into a broad and rounded process at the base of which the second segment is inserted. From the antero-interior angle a very long and slender spine is directed upwards and somewhat inwards. Segment 2 is one and a half times as long as broad and has a small, distal process on the anterior side. Segment 3 is slender and about three times as long as 2. The flagellum with numerous segments.

Antenna 2 in males between two and three times as long as body; total length in females unknown. The first segment (fig. 31 c) is very short and has on the outer margin an extremely long and slender spine. The next segment is unarmed but the third which is longer than broad, is furnished with two, somewhat shorter spines, one on the outer and one on the inner margin. Segment 4 is about as long as broad, while segments 5 and 6 are exceedingly long and slender, the latter being the longer.

Left mandible (fig. 32 a) has a compressed cutting edge with two distinct teeth and below them a small one. The movable lacinia is long and pointed. Below it is a row, consisting of numerous spines. The molar process is somewhat compressed so that it is broader when seen from the front than when seen from below as in the figure; the end is obliquely cut off. The palp is of the ordinary shape, the second segment being more than twice as long as the first.

Maxillae 1 and 2 and maxilliped (fig. 32 b-d) are of the typical shape found in this sub-family.

Pereipods I-IV (fig. 32 e) long and slender as in *S. robustissima,* the first pair being as usual by far the shortest (only two fifths of the succeeding leg). All four legs similar in shape.

Pereiopod V-VII (fig. 32 f) with much narrower carpus and propodus than is usually the case, being between four and five times as long as broad and furnished with swimming setae along both margins.

Female operculum (figs. 30 b and 33 a) seen from below semicircular, with a median keel which has a short spine not far from its base. The keel and the median parts of rest of the operculum have a granulate surface.

Pleopod 3 of female (fig. 33 b) with four setous bristles on inner ramus. Outer ramus has two segments, the distal one with several long and very thin setae at the end.

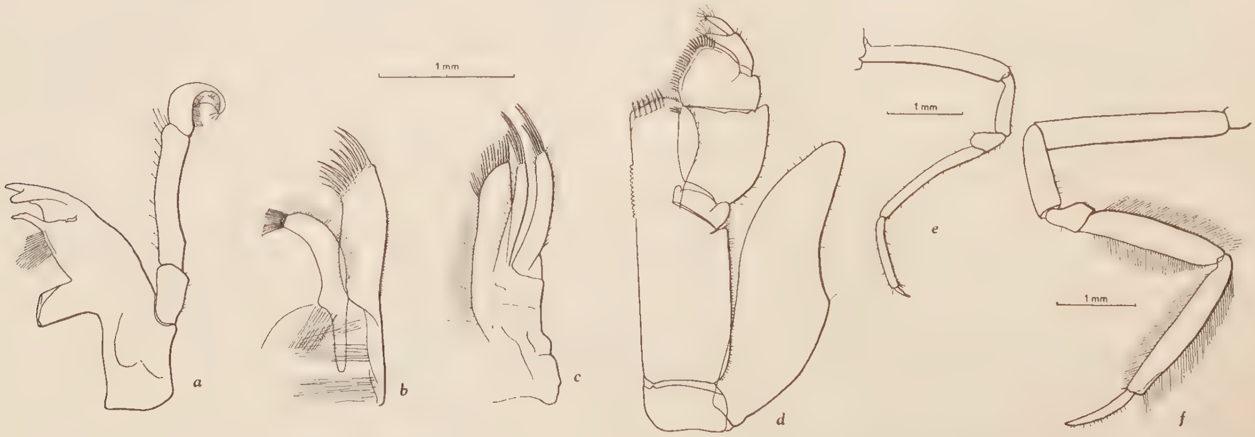

Fig. 32. *Storthyngura benti* n.sp. ♀; a, left mandible; b-c, left maxillae 1 and 2; d, left maxilliped; e, pereiopod I; f, pereiopod VII.

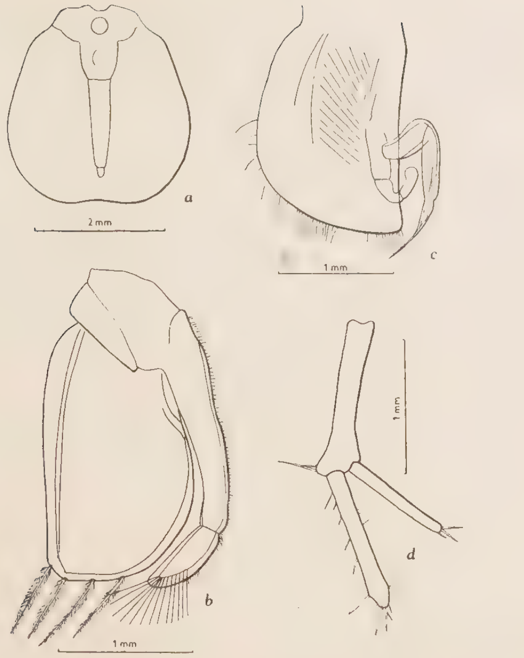

Fig. 33. *Storthyngura benti* n.sp.; a, female operculum; b, pleopod 3 of female; c, pleopod 2 of male; d, left uropod of female.

Male operculum (fig. 31a) a little longer than broad, owing to the fact that the median first pair of pleopods is considerably longer than the second pair, which comprises the rest of the operculum. The median lamella (pleopoda 1) is somewhat narrower in the middle than towards the ends; in the terminal part the outer corner is slightly produced. The copulatory organ in pleopod 2 (fig. 33c) is slender, with the distal filiform end reaching well beyond the end of the pleopod.

Uropod (fig. 33d) reaching a little beyond the terminal spine on the pleotelson. The endopodite is almost as long as the peduncle, but somewhat more slender, and is longer and stouter than the exopodite.

Size: Only the total lengths of the 17 unbroken specimens can be given; they are: St. 651, 10 ♀♀: 14-14-14.5-15-15.5-15.8 (type specimen) – 16.5-17-19, and 19 mm. – St. 658, 2 ♀♀: 15 and 15 mm. – St. 650, 1 ♀: about 19 mm. – St. 658, 2 ♂♂: 13 and 18 mm. – St. 654, 1 ♀: 14.3 mm. – St. 661, 1 ♀ juv.: about 7 mm.

Variation:

Three of the specimens from St. 651 are a little aberrant. A male and a female (of which only the anterior halves are present) have a slender spine not only on the antero-lateral angles of somite 4 but also on somite 3; the latter is half as long as that on somite 4. Besides, a female (only posterior half present) has an extra spine on the left side of the pleotelson between the two foremost lateral spines, being shorter than either of these. In all other respects the three specimens agree with the description given above.

The five specimens from St. 658 are identical with the type from St. 651 except in two respects: 1) All spines are a little longer and more slender and 2) the middle, lateral spine on pleotelson is somewhat shorter and thicker. The female from St. 650 agrees with the type in all respects (pleotelson is absent).

The female from St. 654 has all the dorsal, lateral and epimeral spines on the pereion and pleon furnished with rather long, closely set setae, except near the base. Moreover, the dorsal and lateral spines on pereion somites 5-7 and pleon are considerably longer and stronger than normally; the lateral spines are about one and a half times longer than in the type, and the dorsal spines are between two and three times as long. On the contrary, the operculum has no median spine at all and the projections on the keel, separating the terminal face from the operculum, are very small. Finally, the uropods are more slender.

The female from St. 661 is a somewhat mutilated juvenile. In that specimen not only the spines on the posterior half of the pereion and on pleon are longer; the same applies to all the spines on pereion somites 1-4 as well. Nor is there any median spine on the operculum in this female. The very thin and brittle integument has a fine, net-like pattern which gives a general white-greyish colour. But all the edges have a row of purely white, very tiny protuberances which are not found in the adults.

Remarks:

The present species can be distinguished from most of the other species of *Storthyngura* by means of one or more of the following conspicuous characters: 1) presence of dorsal spines a) on head, b) on first pereion somite and c) on pleotelson; 2) shape of pleon, which is furnished with three instead of the usual two pairs of lateral spines. Only *S. elegans* (VANHÖFFEN 1914, p. 584) has also three pairs of lateral spines on the pleon which, however, terminates with an incision instead of the conspicuous spine found in *S. benti;* besides, there are no spines on head and on the first pereion somite of *elegans,* and the species is much smaller. In *S. magnispinis* (Rich.) three dorsal spines or tubercles are found on pleotelson (as well as spines on head and first pereion somite). The pleon has, however, only two pairs of lateral spines, and the terminal part is broad and squarish instead of pointed (HANSEN

1916, pl. XII, 3). *S. atlantica* (BEDDARD 1886, pl. IX, 13) has two distinct dorsal spines on pleotelson (and on head) but lacks the spine on the first pereion somite, and an examination of the type specimen in London showed that also the dorsal pair of spines on somite 7 is absent; furthermore, the pleon has only two pairs of lateral spines, and the spine on the basal segment of antenna 2 is lacking.

Nearest to the present species is definitely *S. robustissima,* described by MONOD (1926, p. 18) on a female dredged at a depth of 400 m in the antarctic Sea, SE of Cape Horn (71°S) and later recorded by STEPHENSEN (1947, p. 8) from a depth of 750 m at the South Shetland Is. In general appearance, size and armament with both lateral and dorsal spines on head and pereion the two species are quite identical. Through the courtesy of Mr. N. KNABEN, Oslo Museum, I have been able to examine the male and female from the S. Shetlands and found that *S. benti* shows the following major differences: 1) There are only two median dorsal spines on the pleon of *benti* instead of four. 2) Pleon with only three distinct lateral spines instead of four spines or processes. 3) Terminal spine almost straight instead of strongly curved upwards. 4) No lateral spine on inner side of basal segment of antenna 2. 5) Mandible with a distinct molar process which seems to be absent in *robustissima* (MONOD 1926, fig. 11 A); the other mouth appendages equal or subequal. 6) Carpus and propodus of pereiopod V-VII between four and five times as long as broad instead of a little less than three times. 7) Copulatory organ on male pleopod 2 almost as long as operculum instead of less than three fifths of the operculum.

This species has been named after Mr. BENT HANSEN, M. Sc., Assistant Zoologist on the Galathea.

Distribution:

So far known only from the Kermadec Trench NE of New Zealand, 5340-7000 m; 1.1-1.3°C.

Storthyngura pulchra (Hansen), 1897

Eurycope pulchra Hansen, 1897, p. 98, pl. I, 1.

Eurycope caribbea Benedict, in: RICHARDSON 1901, p. 559, fig. 29.

Eurycope carribbea Benedict, RICHARDSON 1905, p. 493, fig. 548.

Storthyngura caribbea (Benedict), VANHÖFFEN 1914, p. 584.

Storthyngura pulchra (Hansen), HANSEN 1916, p. 132.

Storthyngura caribbea (Benedict), HANSEN 1916, p. 132.

Material:

St. 650, Kermadec Trench (32°20′ S, 176°54′ W), 6620 m, 15. Febr. 1952. Gear: 6 m sledge trawl. Bottom: brown clay with pumice. Bottom temp.: 1.3°C. – 4 females, one without pleotelson; 2 males, one very mutilated, both without pleotelson; 1 very mutilated specimen; 1 juv. female.

St. 716, off Pacific Central America (9°23′N, 89°32′W), 3590 m, 6. May 1952. Gear: herring otter trawl. Bottom: dark, muddish clay. Bottom temp.: about 2.0°C. – 3 males.

St. 724, Gulf of Panama (5°44′N, 79°20′W), 2650-3250 m, 12. May 1952. Gear: 6 m sledge trawl. Bottom: dark clay and stones. Bottom temp.: about 2.0°C. – 1 female + 1 juv. female.

HANSEN'S very careful description and figures made it possible for me to decide without hesitation that the above-mentioned 13 specimens belong to *S. pulchra* (Hansen). Moreover, I feel convinced that *S. caribbea* (Benedict) also belongs to this species. The only cases of disagreement will be pointed out in the following description. For the sake of convenience the specimens described as *S. pulchra* are called the Galapagos specimens (although some were caught in the Gulf of Panama), *caribbea* the Windward, and the Galathea material is called the Kermadec and the Panama specimens respectively.

Description:

Head: The general descriptions given by HANSEN and BENEDICT agree with each other and with the Kermadec and Panama specimens in all details except two: HANSEN speaks about a »rather good-sized process« situated in the median line, behind the deep furrows (cf. figs. 1 & 1 a). This process is also present in the Panama specimens, but is absent both in the Windward and the Kermadec specimens. Besides, there are in the Galapagos specimens two »rather small«, acute processes behind antenna 1 which are also present in the Panama specimens. However, in the Kermadec material a rounded and rather inconspicuous process is found in this place, being the most elevated part of the oblong tubercle, found on each side behind the antennae. This tubercle was also described by BENEDICT, who does not, however, mention any process at its antero-interior corner.

Body: The very characteristic shape of the seven pereion somites and their armament with spines is almost identical, the only differences being that in the Kermadec specimens the three median spines and the small protuberances immediately behind them are not especially compressed laterally at the base, and the latter are not very conspicuous in some of the specimens. Moreover, according to BENEDICT's description of the Windward specimen, the second somite has a short, sharp spine on the antero-lateral angles like those found in segments 3 and 4, but it is not given in the figure and is probably due to a confusion with the epimeral spines on that segment.

According to BENEDICT, there is on the median line of the ventral surface of pereion somite 1 a sharp, curved spine and prominent, longitudinal ridges on somites 2-4. In all the Panama specimens the ridges are furnished with forward directed spines, almost as long as the likewise forward pointing median spine on somite 1. In the Kermadec material ridges and small spines are present in a few of the males and females (including the juvenile) but are completely or almost absent in the other specimens. On the median ventral side of the coalesced somites 5-7 there is in the Windward and Panama specimens a compressed, forward directed spine anteriorly, followed by a longitudinal ridge, which is separated in five places by transverse grooves. In the Kermadec specimens there is a low ridge and corresponding low grooves; most of the specimens have no anterior spine, but those with spines on somites 1-4 have a rather stout, not compressed spine which is directed only moderately forward. HANSEN does not mention these ventral spines and ridges in his description; this is rather strange, since at any rate the interrupted ridge on somites 5-7 is clearly visible on his fig. 1a. The ventral spines are probably also present in HANSEN's Galapagos material, the more so since they are well developed in the Panama specimens.

Pleon has the same shape in all the specimens in which it is preserved. The terminal spine in the Kermadec specimens is not so decurved as in the Panama, the Galapagos, and the Windward materials. The animals from Panama have an oblong terminal face, exactly corresponding to the one figured by HANSEN (1 i). In the Kermadec specimens, however, it is considerably more rounded; the anal doors are much closer to the ventral keel of the terminal face and consequently occupy a greater part of it.

Antennae 1 and 2 in the Kermadec and Panama specimens agree with the descriptions; in no case are more than the four proximal segments of antenna 2 present.

Mandibles. The second segment of the palp is comparatively longer in the Kermadec than in the Galapagos and Panama specimens (not described in the Windward specimen), being two and a half to three times as long as the first segment. In one of the Kermadec males the incisive part of the mandibles has only one tooth instead of the normal three. All the other mandibles as well as the remaining mouth parts of this male and of the other Kermadec specimens, are, however, almost perfectly identical with those of the Galapagos animals.

Pereiopods I and V-VII are present both in the Galapagos, the Panama, and the Kermadec materials and are identical. These appendages are nearly equally long within the same specimen. In one of the males from Panama also pereiopods II-IV are preserved. They are extremely long and slender. Pereiopod II is twice as long as I, III more than three times as long, and IV almost four times as long as I and more than twice as long as the whole animal. Especially propodus is very elongated in pereiopods III and IV. BENEDICT's figure of pereiopod IV is uncorrect, the elongate propodus having been omitted.

The female and male opercula agree with HANSEN's description and also the uropods are equal (BENEDICT says nothing about terminal face, opercula, uropods, etc.). HANSEN's fig. 1 i of the ventral side of the male pleon may give the impression that the postero-lateral angles of the operculum are strongly produced. This is, however, not the case, each pleopod 2 being almost semicurcular as shown in fig. 34 b of the present report. This misconception is due to the fact that the two second pleopoda are set at right angles, when in situ. Fig. 34 b also shows the copulatory organ (not described by HANSEN); the filiform end reaches a little beyond the apex.

Size: St. 650, 4 ♀♀: about 21, 25, 25, and 27 mm. 2 ♂♂: about 18 and about 22 mm. Sex unknown: about 26 mm. Juv. ♀: 9 mm. – St. 716, 3 ♂♂: 22,2, 25.3, and 26.0 mm. – St. 724, 2 ♀♀: 25.4 and about 11.5 mm.

Juvenile female. In the Kermadec collection there is a juvenile specimen 9 mm long, only 1/3-1/4 as long as the adults. Since young forms of the genus *Storthyngura* are quite unknown – except for the doubtful young figured by BEDDARD (1886, pl. IX,2) – this specimen is of considerable interest, and I

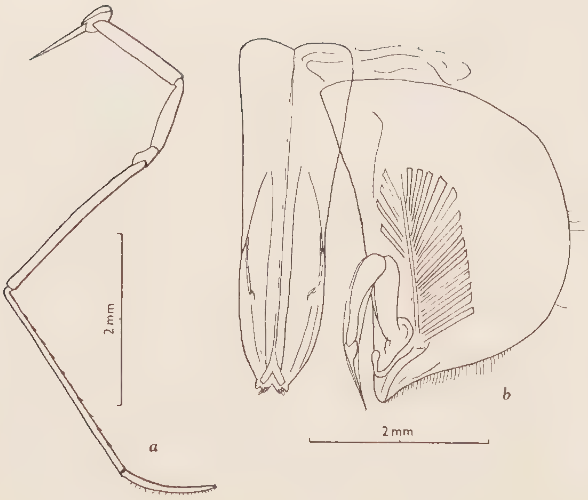

Fig. 34. *Storthyngura pulchra* (Hansen); a, pereiopod II of juvenile female from St. 650; b, operculum of adult male, seen from inside (dorsal view).

shall give an account of all the characters in which it differs from the adult females:

Almost all spines are longer and more acute than in the adult, this being especially the case with the epimeral spines, the lateral spines on pereion somites 5 and 6, the median, ventral spine on somite 5, the first pair of lateral spines on the pleotelson, and the spine on the operculum. The terminal spine on the pleon is also longer and more decurved, even longer and stouter than in the adult figured by HANSEN (fig. 1 a).

Pereion somite 7 is much smaller than the two preceding ones, being both narrower and only about half as long. The median part of it is quite convex, and there is no trace of the two spines on either side of the median line. The lateral spines of this somite are also much shorter than in the adult, being less than half as long as the spines on somite 6.

The second segment of the palp of the mandibles is less than half as long as the first, just as in the Galapagos and Panama specimens, but otherwise than in the rest of the Kermadec material. Also the shape of the movable lacinia is more similar to that of the former than to that of the latter specimens.

Finally, pereiopod II is preserved (fig. 34a). The relative length of the segments is almost the same as the adult (from Panama), but the entire leg is a little shorter than the entire animal, while in the Panama specimen it is a little longer.

Of the above-mentioned characters greater length of spines and late development of the last thoracic somite are typical of juvenile isopods. It is, however, interesting to note that in two of the significant characters in which the adult Kermadec specimens differ from the Galapagos specimens, the juvenile from Kermadec is identical with the animals from Galapagos, viz. in the decurved shape of the terminal spine and in the shape of the mandibles.

Variation:

Above have been mentioned all the known differences between specimens of *S. pulchra* from various localities. As will be seen, the specimens from the Gulf of Panama and from near the Galapagos are quite equal, while some differences are found in the other two materials. This must also be expected when the great distances are taken in account. I have, however, not found them of specific value. The following table gives a summary of these differences.

Table 2. Varying characters of *S. pulchra* from different localities in the Pacific and the Atlantic.

Characters	Galapagos	Panama	Kermadec	Windward
Median process on head	+	+	÷	÷
Ventral ridge on somites 2-4	+?	+	(±)	+
Ventral spine on somite 5	?	+	±	+
Terminal face oblong or round	o.	o.	r.	?
Segment 2 of mandibular palp short or long	s.	s.	l.	?

Remarks:

S. pulchra is not very far from *fragilis* (Beddard) from which it differs mainly in the shape of the pleon, i. e. absence of the deep notch in front of the distal lateral spines and absence of the conspicuous spine on the proximal part of the pleon, found in *fragilis*.

Distribution:

Known from several widely separated localities in the Atlantic and the Pacific Ocean. 1) Windward Is. in the West Indies, 1260 m (BENEDICT). 2) Off Pacific Central America (9°23'N, 89°32'W), 3590 m, about 2°C. 3) Gulf of Panama (6°10'N, 83° 06'W), 2690 m (HANSEN) and 5°44'N, 79°20'W, 2650-3250 and about 2°C; 4) north of Galapagos Is. (2°34'N, 92°06'W), 2490 m (HANSEN); 5) Kermadec Trench NE of New Zealand (32°20'S, 176° 54'W), 6620 m, 1.3°C.

Storthyngura furcata n. sp.

Material:

St. 658, Kermadec Trench (35°51′S, 178°31′W), 6660-6720 m, 20. Febr. 1952. Gear: 6 m sledge trawl. Bottom: brown sand with clay and stones. Bottom temperature: 1.3°C. – 1 complete female + mutilated posterior half of 1 female; 1 complete male, but broken.

St. 654, Kermadec Trench (32°10′S, 175°54′W), 5850 m, 18. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temp.: 1.2°C. – Pleon of 2 females + 1 smaller female without pleon.

Type specimen:

The complete female from St. 658 was selected as type.

Description:

Body (fig. 35a) oblong, more than three times as long as broad.

Head with a pair of broad and low tubercles behind the antenna. Posteriorly these vaulted areas are separated from a median triangular patch by a pair of convergent furrows which extend laterally a little in front of the hind margin of the head. As in *Ilyarachna antarctica* (fig. 25, p. 107) these vaulted areas probably indicate the extension of the original eyes. The surface of the tubercles has a corroded appearance. The sides of the head are somewhat swollen. There are no spines on the head.

Pereion somites 1-4 almost agreeing with the description of *S. benti* (p. 113), but the transverse furrows which make the somites saddle-shaped are more pronounced. The median spines are fairly short, only about one sixth of the width of the somites, and the antero-lateral spine on somite 4 is minute. Also the epimeral spines are shorter and weaker than in *benti,* this especially being the case with the posterior spine on epimera 2-4 which is only about one fourth of the anterior.

Pereion somites 5-7 almost as in *benti,* but the dorsal pairs of spines are set closer together, and those on somites 6 and 7 are shorter, being only about half as long as those on somite 5. Also the lateral spines are somewhat shorter and directed a little more forward.

Pleon (fig. 35 a & b). The pleotelson is shaped like a shield. In this species the terga of coalesced pleon somites are more numerous than in any other species of *Storthyngura.* Anteriorly the usual triangular area, found for instance also in *benti,* is placed. Then follows a short, rod-shaped tergum, and behind that a third one which extends to the antero-lateral corners of the pleotelson; this third tergum is separated posteriorly from the median convexity by a broad transverse furrow and has a median tubercle, as in *S. fragilis* (BEDDARD 1886, pl. IX, 8). The pleotelson is furnished with three pairs of lateral spines; the first two pairs are long and turned somewhat forwards and upwards. The posterior pair is shorter and stouter; the spines rise very close to each other, forming a characteristic, v-shaped terminal part of the pleotelson. They are bent slightly downwards. The pleotelson is divided into three equally broad convexities by two longitudinal furrows. The median one ends a little in front of the hind margin of the pleotelson and has an indistinct transverse furrow near its anterior end. The two lateral convexities are shorter and suboval, terminating with a short, deep, transverse furrow just in front of the base of the middle pair of lateral spines.

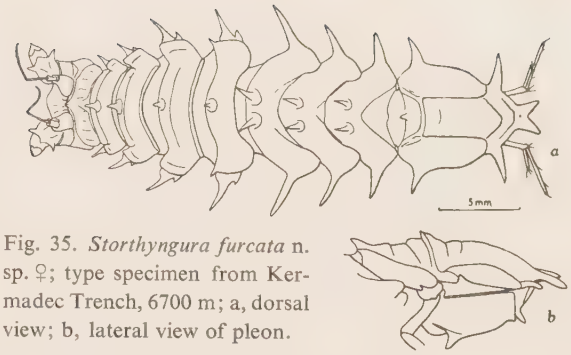

Fig. 35. *Storthyngura furcata* n. sp. ♀; type specimen from Kermadec Trench, 6700 m; a, dorsal view; b, lateral view of pleon.

On the ventral side of the pleon a keel similar to that in *benti* is found; the median crest has two strong downward and backward directed processes. The terminal face is surrounded by a projecting edge on all sides; when seen directly from the ventral side of the animal (at an oblique angle) it is diamond-shaped, when seen at a right angle it is almost circular. Nearly the whole surface is occupied by the semicircular anal doors.

Antenna 1 reaches backwards to pereion somite 3 in the female and to somite 4 in the male. The first segment is subcylindrical, but somewhat broader and with a depression at the proximal end. Along the outer margin there is a low keel. The second segment is longer than broad, with a small process at the interior, distal angle. The following segment is cylindrical and several times longer than broad. The segments of the flagellum are very short, especially in the male, and very numerous.

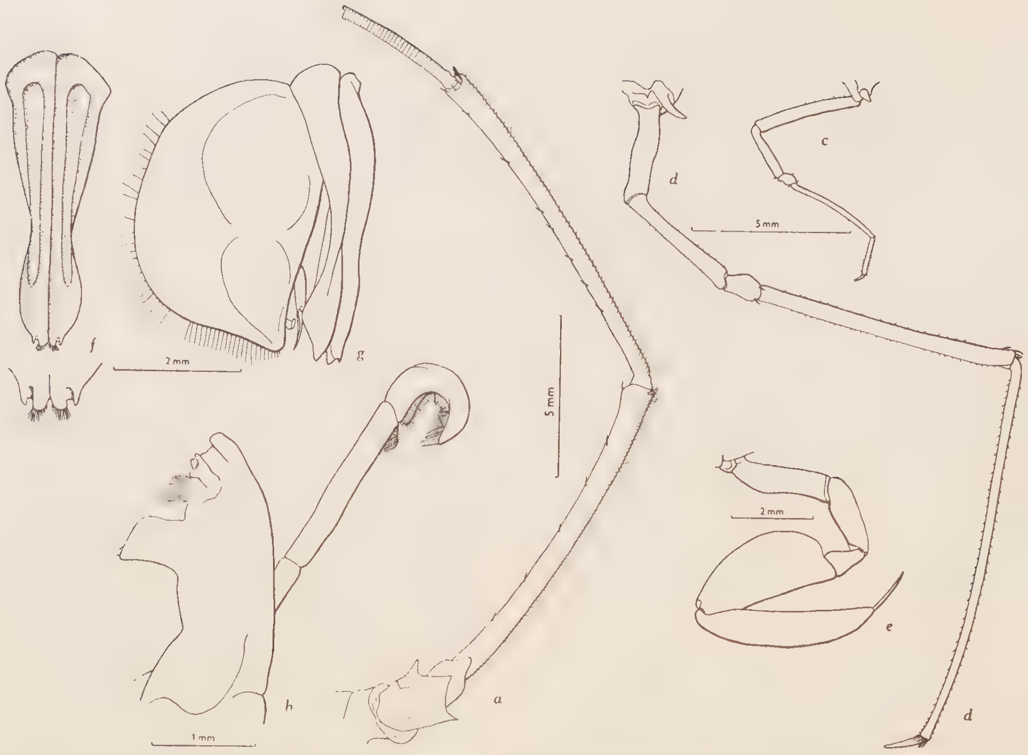

Fig. 36. *Storthyngura furcata* n. sp.; a, right antenna 2 of female; b, left mandible of female; c-d, pereiopoda I and III of male; e, pereiopod V of female; f, male pleopoda 1, seen from inside (dorsal view); g, male pleopod 2 and edge of pleopoda 1 (to the right).

Antenna 2 (fig. 36a) has the first and second segments unarmed. On the third there is a stout distal spine directed inward and forward and also a spine-like squama, marked off from the segment by a conspicuous suture on the outer side. Between these two spines the distal upper margin is strongly produced. Segments 5 and 6 are very elongated, 6 being a little longer than 5. The flagellum is stout, and the segments are short and exceedingly numerous.

Left mandible (fig. 36b) has only one tooth in the cutting edge. The movable lacinia short and blunt with very inconspicuous teeth. The second segment of the palp more than twice as long as the first.

Maxilla 1 and 2 and maxilliped typically shaped. In maxilla 2 the inner lobe on basis is somewhat longer than the outer.

Pereiopod I (fig. 36c) is very short, only one third of pereiopod III. Merus not so extended as in *benti* and propodus less than half as long as carpus.

Pereiopod III (fig. 36d) very slender with the two ultimate segments about as long as segments 3-5. Pereiopods II and IV are absent.

Pereiopod V-VII (fig. 36e) as in *pulchra,* except that propodus is somewhat narrower, being five times as long as broad instead of about three times in *pulchra.*

Female operculum (fig. 35b) of the same shape as in *benti.* Surface of keel and median parts corroded rather than granulated.

Pleopod 3 of female as in *benti,* but outer ramus a little longer.

Male operculum somewhat longer than broad. The first pair of pleopods (fig. 36f & g) only a little longer than the second and with a very conspicuous narrowing a little beyond the middle, due to the concave outer margins. The apex has a short and acute outer process, and the inner lobe furnished with hairs. On the ventral surface of the operculum (pleopod 2) the median half has two vaulted areas of which the proximal one is the bigger. The filiform end of the copulatory organ hardly reaches to the end of pleopod 2 (fig. 36g).

Uropod reaches far beyond the two terminal spines on pleotelson. Endopodite almost twice as long as peduncle, but somewhat more slender and almost three times as long as the exopodite and a little stouter (fig. 35a).

Size: 1 ♀ (type specimen): 30.5 mm. 1 ♂ about 25 mm. 1 ♀ (only posterior half): between 26 and 29 mm.

Variation:

The three specimens from St. 658 are quite equal. The two fragments of larger females from St. 654 have conspicuously smaller lateral spines on pleon, while, on the contrary, the median spine on the operculum of one of these females is longer and more slender than in the type from St. 658. The median spine in the other female is like that of the type. It was not possible to see any notable differences between the smaller, mutilated female and the type specimen.

Remarks:

VANHÖFFEN (1914, p. 584) has described a species of *Storthyngura, S. elegans,* on a single female from the Antarctic Sea (3423 m). In some respects it seemed related to *furcata,* but a sufficiently detailed comparison could not be made on the basis of VANHÖFFEN's short description and single figure.

Through the courtesy of Dr. J.-E. GRUNER of the Berlin Museum I have borrowed the type specimen of *elegans.* It is only 2.3 mm long and certainly juvenile.

A comparison with *furcata* shows the following resemblances:

1. Shape of pleon with three pairs of spines of which the last pair is terminal in both. There are, however, some differences even if they are alike in the general appearance: In *elegans* the pleon is about one fourth broader than long (measured to end of spines) while in *furcata* it is about as long as broad. Further, the spines are comparatively longer in *elegans* (especially the anterior pair) and much broader, as shown in VANHÖFFEN's fig. 114. Besides, the margin between the base of the middle pair of spines and the apex of the terminal spines is only slightly concave in *elegans,* while it has a conspicuous angle in *furcata.* Finally, the median part of the pleotelson is not so much vaulted in *elegans,* and there are no longitudinal convexities laterally in that species. – 2. Armament with lateral and epimeral spines is identical.[1] There are, however, no epimeral spines on the first somite in *elegans,* and the lateral spines on somites 5-7 are much broader. – 3. Shape of peduncle of antenna 2 is equal.

The main differences (besides those given above) are:

1. Lack of paired dorsal spines on pereion somites 5-7 in *elegans.* This may, however, be due to the fact that *elegans* is a juvenile. Above (p. 118) a juvenile of *S. pulchra* is described which has not yet developed the dorsal spines on the seventh somite, found in the adult. – 2. The conspicuous dorsal spine on first pereion somite in *furcata* is absent in *elegans.* – 3. The same applies to the dorsal process on the proximal part of the pleon in *furcata.* – 4. There is no keel separating the operculum from the terminal face on the ventral side of the pleon of *elegans.* – 5. First segment of antenna 1 in *elegans* has a distal, interior spine not found in *furcata.* – 6. Carpus of pereiopods VI and VII is somewhat longer than propodus in *elegans,* while in *furcata* it is somewhat shorter. – 7. Dactylus of the same legs in *elegans* almost as long as propodus, but only about one fourth as long in *furcata.* – 8. Lower surface of female operculum of *elegans* rounded both longitudinally and transversely, i. e. without any median keel and spine. – 9. Uropods reach far beyond the terminal spines of the pleon in *furcata* while they are only a little longer than the spines in *elegans* and also have comparatively shorter inner rami.

As will be seen, the differences between the two species are rather significant and justify the establishment of a new species, especially since the variation within this genus seems to be so slight (cf. *pulchra* and *benti).* On the other hand, *furcata* is probably nearer to *elegans* than to any other species of *Storthyngura.*

The pleon of *S. magnispinis* (Rich.) resembles that of *furcata* except that the posterior part in *magnispinis* is produced and transverse instead of furnished with two spines, but morphologically these features are not far from each other. The two species differ, however, in a good many characters, for instance in tubercles on head and pleotelson, antero-lateral spines on pereion somites, spine on female operculum, keel round the terminal face, first segment of antenna 1, etc.

Distribution:

Known only from the type locality, Kermadec Trench NE of New Zealand, 6660-6720 m, 1.3°C.

Storthyngura novae-zelandiae (Beddard)[2]

Description of embryos.

While studying the type collection of *Storthyngura* (*"Eurycope")* species from the Challenger, kept in the British Museum (Nat. Hist.) in London I found

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[1] The lateral spines on somites 2-4 do not – as shown in VANHÖFFEN's figure – emerge from the terga, but are true epimeral spines – except the antero-lateral spine on somite 4.

[2] The correct spelling of this specific name would seem to be *novae-zealandiae,* but since BEDDARD consistently uses *novae-zelandiae* this spelling cannot be regarded as an inadvertent error, and must stand.

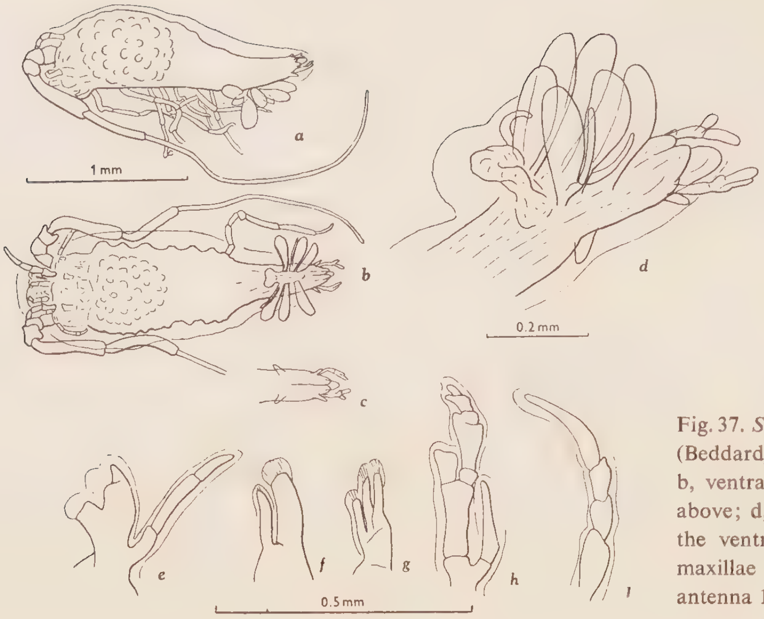

Fig. 37. *Storthyngura novae-zelandiae* (Beddard); embryos; a, side view, b, ventral view; c, pleon of b from above; d, pleon, seen obliquely from the ventral side; e, mandible; f-g, maxillae 1 and 2; h, maxilliped; j, antenna 1.

a female specimen of *S. novae-zelandiae* with a marsupium partly filled with embryos which were still quite firmly packed together. There were 43 specimens in all, but there may originally have been twice as many, judging from the size of the marsupium.

The female is 14.4 mm long (Beddard (1886, p. 61) gives the maximum size of this species as 12 mm); it was dredged together with several other specimens of this species at Challenger Station 168, off New Zealand (40°28′ S, 177°43′ E), 8. July 1874. The depth was 2102 m, and the bottom temperature is given as 2.8° C.

Since no other embryos of this deep-sea genus have so far been described I found it useful to give a description of these embryos. I take the opportunity to thank Dr. I. Gordon for lending me the material.

The embryos are still so undeveloped that antennae and legs are very soft and greatly entangled in each other.

The *body* of each embryo is surrounded by a transparent cover which is indicated on the illustrations. In each body a yellowish yolk-sack is clearly visible and shown on fig. 37a & b. The general shape of the body is narrower than in the adult (pl. IX, 1), especially towards the pleon. The sharp distinction between somites 1-4 and 5-7 is not yet visible, nor have lateral and dorsal spines been formed.

The *pleon* is much narrower than in the adult in which it is triangular with almost equally long sides. In the embryos it is about twice as long as broad. On the dorso-lateral side there is one pair of processes towards the anterior end and another pair just in front of the uropod (fig. 37c). These processes presumably later develop into the two pairs of lateral spines on the pleon. The posterior end of the pleon has three stout, rounded processes, two on the ventral side and one dorsally, which is somewhat longer.

The *antennae* of embryo and adult are rather different. First segment of antenna 1 (fig. 37j) is not much broader than second and third, and the flagellum is still very short. Antenna 2 has three basal segments like those in the adult, but segments 4 and 5 are much shorter, while the flagellum, on the contrary, is very much larger than in the adult.

Mouth-parts (fig. 37e-h). The mandibles have not yet developed the strong secondary tooth and the spiny row found in the adult (pl. IX, 3), nor has the terminal segment of the palp become curved. The maxilliped is still more slender than in the adult in which, according to Beddard, it is like that in *Eurycope sarsii* (pl. XI, 6).

The *pereiopods* seem to have reached their full length, but the three posterior pairs have not yet become natatory (fig. 37a).

In about half the embryos the pleon is sufficiently well preserved to show that there is a thick, bilobed plate on the ventral side (fig. 37b and d), succeeded constantly by dispositions to three pairs of pleopods. This plate probably developes into the operculum, but I could see no difference in male and female embryos (both must certainly be present among forty specimens), even if the male operculum is composed of two pairs of pleopods and the female operculum of one pair only.

All three pairs of *pleopods* posterior to the above mentioned plate are subequal in size and shape, except that the two anterior pairs have a well developed exopodit.

According to BEDDARD the *uropods* are "very minute and biramose; the inner branch is much shorter and more slender than the outer branch . . .". In the embryos the uropods are, however, very long compared to the total length of the animal, and the inner branch is definitely longer and stouter than the outer.

Size: The majority of the embryos are 1.5 mm long. A few are less developed, being only about 1.2 mm.

Eurycope G. O. Sars

Eurycope G. O. Sars, 1864, p. 4 (208)
Eurycope G. O. Sars, 1899, p. 144
Eurycope G. O. Sars, HANSEN 1916, p. 137

Even if the genera *Storthyngura* Vanhöffen and *Munnopsurus* Richardson have later been established on species originally included in *Eurycope,* the latter genus still contains 31 species to which it has been necessary now to add three new species.[1] Perhaps a few of all these species, some of which are known in one specimen only, may at a closer examination turn out to be synonymous. It is also questionary whether they should all be included in one genus. For instance, it is probable that not all species have the seventh pair of legs natatory *(E. frigida* Vanh. seems to be one of these) and might therefore – in connexion with other possible features of generic value – be transferred to a new genus. However, the pereiopods are missing in several species which prevents a revision until more material is available. But on the whole *Eurycope* is a well defined genus which presumably dates far back and has developed into some of the best swimmers within the Asellota. In spite of this it must be regarded as a typical bottom-living genus, since till now all species except one have been captured with dredges or trawls only. This single pelagic species is *E. murrayi* Walker which has always been caught in nets, towing in the free water masses.

The present material from the Galathea contains three specimens, two males and one female, belonging to three different species.[2] One of them proved to be identical with *E. nodifrons* Hansen. The second is a new species, *E. madseni,* but is rather close to *E. ovalis* Vanh. Also the third species, *E. galatheae* was hitherto unknown but is nearly related to *E. vicarius* Vanh. Since VANHÖFFEN's description of *ovalis* and *vicarius* seemed to me to be insufficient for a comparison, I have given a description of them below, based on the types and cotypes, originating from the German Antarctic Expedition (Gauss) and kindly lent to me by the Berlin Museum. Moreover, the study of the material of *vicarius* showed that some of the specimens could not belong to that species. One of these had to be regarded as a new species, and the remaining specimens proved to be antarctic representatives of *E. brevirostris* Hansen. For the sake of convenience I have included the description of *E. gaussi* n. sp. and the discussion of the material of *brevirostris* in the present Report.

Eurycope nodifrons Hansen, 1916

Eurycope nodifrons Hansen, 1916, p. 140, pl. 13, 1 a-d.

Material:

St. 651, Kermadec Trench (32°10′ S, 177°14′ W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 1 female, complete but broken, with well developed marsupial plates.

The present specimen has suffered rather badly during the dredging and has lost all pereiopods and pleopods as well as the flagella of the antennae. The body was very much shrunk, but after a careful stretching it could be studied, and reliable drawings made of head, all pereion somites, pleon, mouthparts, etc. This meant that I could undertake a sufficiently careful comparison with the type specimen, the only specimen of the present species hitherto known.

Description:

Female. Body (fig. 38a) oval in shape and rather broad. Owing to the originally shrunk state of the specimen the ratio between total length and largest

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[1] *Eurycope fusiformis,* described by BARNARD (1920, p. 423), is definitely a species of *Ilyarachna.* This can be judged both from the description, the figure (pl. 17, fig. 20) and from BARNARD's comparison with *Ilyarachna plunketta* and *I. abyssorum* which *fusiformis* "likes in general appearance" and is "very close to".

[2] Of one of the species also a very mutilated posterior half was captured.

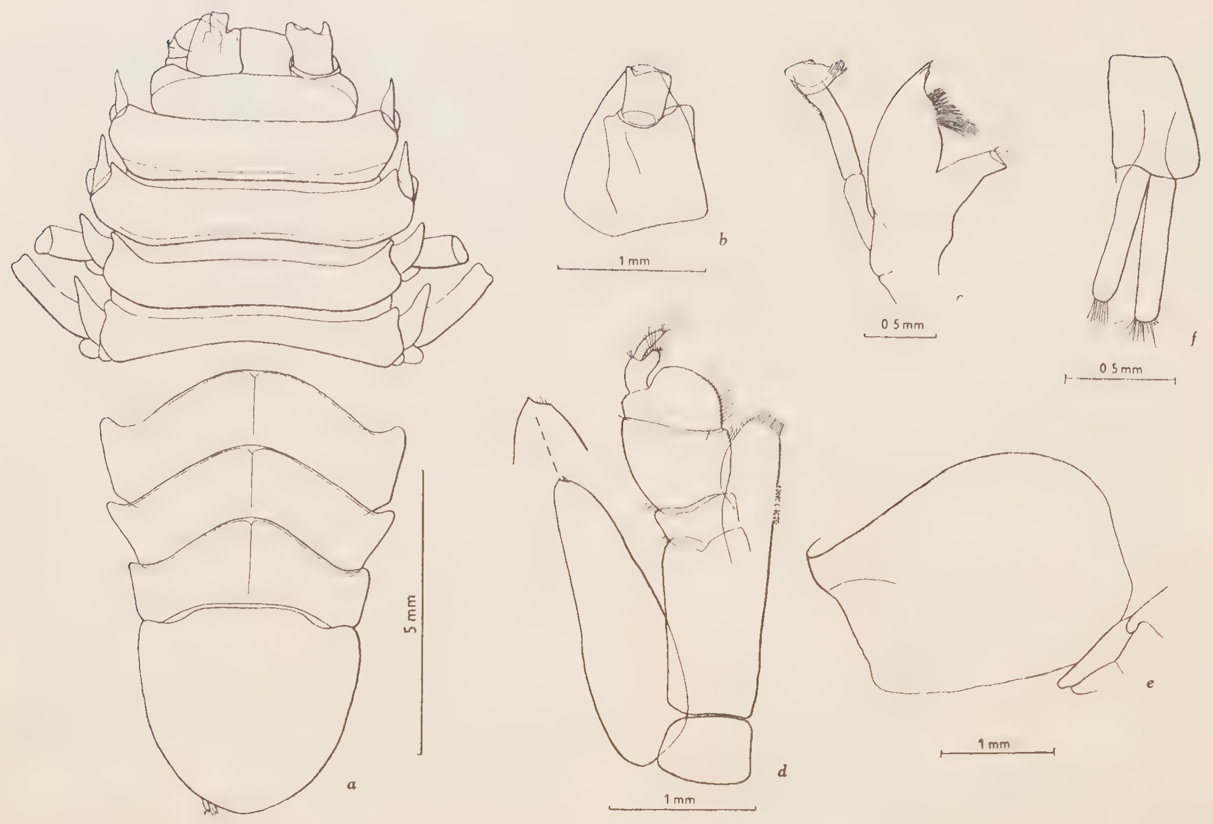

Fig. 38. *Eurycope nodifrons* Hansen; ♀ from the Kermadec Trench, 7000 m; a, dorsal view; b, left antenna 1; c, right mandible; d, right maxilliped; e, lateral view of operculum; f, right uropod.

width cannot be given exactly. The whole integument of body and appendages is covered with a very fine structure of faintly waved lines, also found in the type.

Head shaped exactly as in the type specimen with the characteristic straight frontal part (a very rare feature within the group), the rounded keel, and the lateral protuberances.

Pereion somites 1-4 of the same general shape, and decreasing in length from 1 to 4. Somite 1 is about one fourth longer than 2 in both specimens. In HANSEN's fig. 1a (pl. 13) it is drawn much too long. The only difference between the type and the Kermadec specimen is that the latter has the anterior epimeral plates still a little longer than in the type; they are triangular and acute when seen obliquely from the side.[1]

Pereion somites 5-7 are a little broader in proportion to the length than in the type, but are otherwise quite corresponding. They also have the same faint longitudinal impression in the middle.

Pleon (of the type) is by HANSEN given as "nearly as long as broad". According to my measurements it is a little longer than broad. The pleon of the Kermadec female is rather damaged, but it seems as if it was a little shorter, i. e. at most as long as broad.

Antenna 1 (fig. 38b) has the first segment shaped as a flat, triangular plate. The second segment, which is much smaller and a little longer than broad, is inserted on a raised, almost squarish portion of the first segment. The only difference between the two specimens is the relative length and width of the first segment. In the type it is exactly as long as broad (not "slightly broader than long" as stated by HANSEN), while in the Kermadec female it is one fifth longer than broad. In the type there are a few setae on the antero-interior corner of segment 1 and on the distal end of segment 2; they are not found in the Kermadec specimen. Rest of the left antenna 1 and the entire right antenna 1 lost.

Antenna 2 equal except that the squama of the Kermadec specimen is missing the two setae or tiny spines found in the type. The distal segments of the peduncles and the flagella are lost.

Left mandible has the cutting edge furnished with a row of six spines in the Kermadec female and

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[1] In fig. 38a the epimera and first segments of pereiopods 3 and 4 have been turned outwards and are seen in an unnatural position. Epimera 1 and 2 are still in their right position.

about four in the type. In both specimens the movable lacinia has a similar row of fine spines. The spine-row below the incisive part consists of eleven stout, dentate spines (only three-four in the type) and about ten longer setae behind them (about three in the type). The molar process is prominent and semicircular in section. The palp is of the usual type with the third segment bent backwards. Segment 2 is one and a half times as long as 1. Cutting edge of *right mandible* (fig. 38c) with two larger terminal spines and two minor spines along the outer margin.

Maxilliped (fig. 38d) of the same general shape in the two specimens, but the penultimate segment of the palp is broader and more expanded laterally in the Kermadec specimen than in the type. The epipodite of the former has a very slight bend at the apex, furnished with four tiny hairs. A very close examination of the epipodite of the type specimen showed a rounded apex without any bend. But at the same time I found the general shape of the epipodite in full accordance with that of the Kermadec specimen, i. e. not quite so broad and with less sharp corners proximally than in HANSEN's fig. 1c.

Pereiopods. Unfortunately, the majority of all the pereiopods is lost in both the type and the Kermadec specimen; only basis of all legs is still present. I have compared the relative length and width of these segments in the two specimens. In both cases basis of pereiopod I is the longest and most narrow, basis of V the shortest, and basis IV-VI the broadest. There are, however, a few differences between the two specimens: basis of III and VI of the type are relatively shorter than in the Kermadec female (about one fifth) and basis of II-IV about one fourth broader in the type. This seems to indicate that on the whole the type had shorter and stouter legs.

Female operculum (fig. 38e) longer than broad and almost rectangular seen from the side. On the lower surface there is a median keel, stretching from the anterior margin to somewhat in front of the posterior margin where it suddenly ends in a rounded protuberance.

Uropod (fig. 38f) reaches a little beyond the pleon. It has a thick basal segment which is somewhat longer than broad. The exopodite is a little shorter and thinner than the endopodite. The uropods are missing in the type specimen.

Size: The type specimen is 5.1 mm long and 1.9 mm broad. The total length of the Kermadec female can only be given tentatively as 13-13.5 mm and the width as about 7.5 mm.

Variation:

As pointed out above the two specimens agree, to a remarkable degree, when the enormous distance between the two localities (NW Atlantic and SW Pacific) is taken into account. The specimens are conformable to each other in all the essential specific characters: lack of frontal projection and presence of lateral protuberances on head; shape and relative size of pereion somites and pleon; presence of long epimeral plates; shape of first segment of antenna 1; shape of mandible and maxilliped. The differences are: somites 5-7 and pleon, first segment of antenna 1, epimeral plates, and most of the pereiopods a little longer in the Kermadec specimen than in the type, and the pereiopods at the same time a little more slender; number of spines on cutting edge and in spine-row somewhat greater in the Kermadec specimen; shape of penultimate segment of mandibular palp and apex of epipodite in the maxilliped slightly different.

Remarks:

HANSEN (1916, p. 140) regarded *nodifrons* as intermediate between *murrayi* Walker and *inermis* Hansen and pointed out the main differences between these three species. Also *crassa* Vanh. is rather similar to *nodifrons*. It differs in having an obtuse rostral projection, an extremely long first somite (almost as long as the three succeeding somites – MONOD 1926, fig. 12A), no epimeral plates, and the penultimate segment on palp of maxilliped equally broad from base to end.

Distribution:

So far known only in two specimens, the type from the NW Atlantic (Davis Strait – 61°50′N, 56°21′W) at a depth of 2702 m and a bottom temp. of 1.5°, and a female from the Kermadec Trench (32°10′S, 177°14′W) at 6960-7000 m depth and 1.3°C.

Eurycope madseni n. sp.

Material:

St. 651, Kermadec Trench (32°10′S, 177°14′W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 1 male, complete but posterior half rather mutilated.

Description:

Body (fig. 39a) egg-shaped, twice as long as broad, with the greatest width at pereion somite 6.

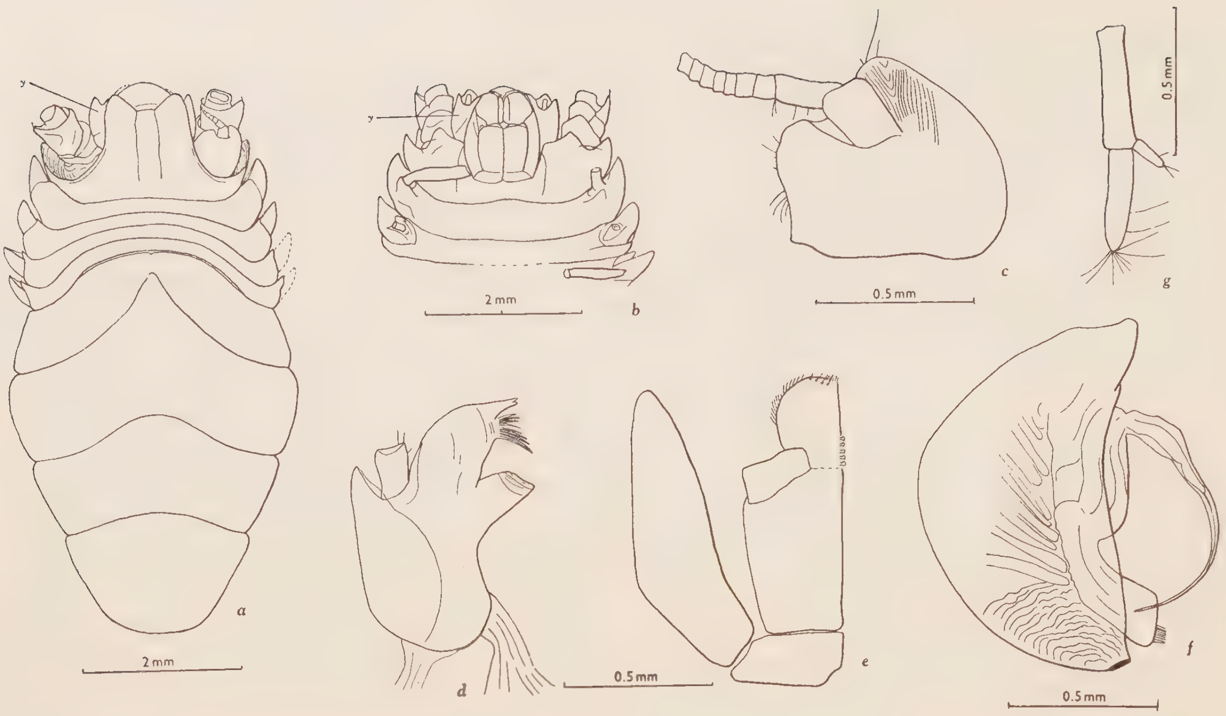

Fig. 39. *Eurycope madseni* n. sp. ♂; type specimen from the Kermadec Trench, 7000 m; a, dorsal view; b, head and pereion somites 1 and 2 from below (y, visible part of mandible); c, right antenna 1; d, right mandible; e, right maxilliped; f, left pleopod 2; near the apex the pattern of the integument has been indicated; g, uropod.

Head rather long, being twice as long as somites 1-4. The frontal projection is larger than in any other species of *Eurycope,* except *ovalis* Vanh. The lateral margins are raised like keels, each of which projects as a rounded triangular tooth. The area between the keels is about one fourth of the width of the whole projection, and its anterior margin is slightly convex. Towards the lateral margins of the head the frontal seam bends forwards and ends in a conspicuous projection which forms the outer boundary of a deep, rounded incision which gives room for the antennae. Between the lateral margin of the frontal projection and antenna 2 the outer margin of the mandible can be seen (y).

When the head is viewed from below (fig. 39b) the two lateral projections appear very similar in size and shape to the epimeral plates of the following segments. Between the projections and the base of the maxillipeds there is another broad projection reaching a little further forwards than the lateral one.

Pereion somites 1-4 are extremely short in comparison with the length of head and especially somites 5-7, which are four and a half times as long. Only in *ovalis* and, to some extent, in *furcata* G. O. Sars and females of *antarctica* Vanh. a body-shape similar to the present one is found. Somite 1 is a little longer than the three succeeding somites which are equally long. The anterior margin of the first somite is almost straight, while it becomes more and more convex in somites 2-4. Laterally somite 1 is rounded, somite 2 has a minute antero-lateral spine, which becomes more prominent in 3 and 4. The epimeral plates are triangular and pointed. They are also triangular in section and decreasing in width from 1 to 4.

Pereion somites 5-7 (fig. 39 a) are extremely long and broad. 5 and 6 are immovably fused. The seam between the two somites is, however, clearly visible. Towards the median part it is pointing forwards in an extraordinary way found only in this species and in *ovalis*. Somite 5 is longest laterally and gradually becomes shorter to near the median part where it suddenly narrows. Correspondingly somite 6 is extremely long in the middle; it is somewhat less than twice as long in the middle as laterally. Somite 7 is of the ordinary shape in the genus, i. e. somewhat broader in the middle than laterally. Along the median line somite 5 is only one sixth of somite 6 which is again one and a half times as long as 7. Laterally the length of the three somites is more equal, somite 6 being only a little longer than 7 which is again slightly longer than 5.

As in *ovalis* the dorsal muscles under the transparent integument form a characteristic pattern which is shown in fig. 40 a.

Pleon, when seen exactly from above, is one and a half times broader than long. Although it is somewhat mutilated there is no doubt that it is rather flat dorsally as well as ventrally. The cavity occupying the pleopods is apparently very small as in *E. furcata* (SARS 1899, pl. 67); the width and length of it is less than one third of the total width and length of pleon.

Antenna 1 (fig. 39c) has the first segment very broad, about one fifth broader than long. It has a dorsal concavity for segment 2 which is much smaller and a little longer than broad. Segment 3 is only half the width of 2. Most of the flagellum was broken off. The appearance of the fine stripes in the integument is shown in the upper corner of the first segment.

Antenna 2 (fig. 39a) has lost the distal segments of the peduncle and the entire flagellum on both sides. The squama is conspicuous and triangular.

Both mandibles (fig. 39d) have an unusual shape, since the outer margin is furnished with a thick, triangular process at the insertion of the palp. On the dorsal side of the mandible a convex seam continues from the base of the process towards the proximal end of the mandible. This process and the outer margin of the mandibles are clearly visible when the animal is seen from above or from below (figs. 39 a and b). A similar process is not known in any other species of *Eurycope* in which the mandible has been studied. The cutting edge has two teeth and there are nine spines in the spine-row. *Left mandible* has three-four teeth on the cutting edge and about the same on the movable lacinia. There are only about seven spines in the spine-row. Both palps were lost except the first segment on both mandibles.

Maxilliped (fig. 39e) is fairly slender, the second segment being one and a half times as long as broad. There are five coupling hooks on the right and four on the left maxilliped. Unfortunately, all the distal segments of the palp are lost on both maxillipeds. The epipodite is also very slender, with a rather pointed apex.

Pereiopods are lost except basis of III-VII. Of these III and IV are long and narrow, IV being a little longer but much broader than III. Basis of V is only half the length of the preceding one and almost as broad as long. Basis of VI and VII are somewhat longer and only about half as broad as long.

Pleopod 2 (male) was the only pleopod preserved (fig. 39f). It is almost semicircular with a rather short and stout copulatory organ.

Uropod (fig. 39g) is long and slender. The endopodite is almost as long as the proximal segment, while the exopodite is a little more than one third of the endopodite.

Size: Total length 6.9 mm and maximum width 3.6 mm.

Remarks:

E. madseni and *ovalis* Vanh. are identical in many features, and the similarities and differences are discussed after the redescription of *ovalis* (p. 129). Only one other species of *Eurycope*, *E. furcata* G. O. Sars, has a rostrum to some extent similar to that found in these two species; it is, however, not so broad and only "minutely bifurcate at the tip" (SARS). Also the shape of the pereion somites shows many similaritites between *furcata* and *madseni*, even if somites 1-4 are somewhat longer and 5 much longer in *furcata*. SARS (1899, pl. 67) does not show the seam between the fused somites 5 and 6. In specimens from the Ingolf Expedition the seam is, however, clearly visible and almost parallel to the posterior margin of somite 6, i. e. without the characteristic, forward directed projection found in *madseni* (and *ovalis*). The ventral side of the pleon in *furcata* and *madseni* is practically identical; in both species the cavity for the pleopods is unusually small. Finally, the shape of the maxilliped is quite equal in the two species.

Besides the differences in shape of rostrum and relative length of thoracic somites a few other dissimilarities should be pointed out. HANSEN (1916, p. 151) described the antennal squama of *furcata* as unusually long and slender, and his fig. 9a (pl. 13) shows that it is quite different from that of *madseni*. Moreover, the mandibles of *furcata* lack the strong triangular process found in *madseni*, and the second pair of male pleopods in *furcata* have a convexity near the distal end and a concavity near the proximal while they are semicircular in *madseni;* besides, the copulatory organ is somewhat larger in the former species. Finally, the exopodite of the uropod in *furcata* is much longer compared with the endopodite than in *madseni*.

The present species is named after Mr. FRITZ JENSENIUS MADSEN, M. Sc., Assistant Zoologist on the Galathea.

Distribution:

So far known only from the Kermadec Trench NE of New Zealand, 6960-7000 m, 1.3°C.

Eurycope ovalis Vanhöffen, 1914

Eurycope ovalis Vanhöffen, 1914, p. 587, fig. 118 a-c.

Since Vanhöffen's description of this species is very insufficient I have given below a supplementary description, based on the only known specimen, a female from the Antarctic, caught by the Gauss on 3. April 1903 at 3423 m depth, and lent to me by the Berlin Museum.

Description:

Body (Vanhöffen 1914, fig. 118 a) egg-shaped, a little more than twice as long as broad, with the greatest width at pereion somite 5.

Head exactly of the same size compared with the pereion somites as in *madseni*. The same applies to the shape of the frontal and lateral projections. There are on the underside of the head the same projections between the base of the maxillipeds and the lateral projections as found in *madseni*, but they are somewhat larger and more rounded than those shown in fig. 39 b.

Pereion somites 1-4 have the same relative size and shape as in *madseni*, and this is also the case with the epimeral plates.

Pereion somites 5-7 (fig. 40 a) have the same general appearance as in *madseni*. In his fig. 118 a Vanhöffen does not show the seam between the immovably fused fifth and sixth somites, but it is as clearly visible as in *madseni* and agrees in all details. There is, however, a remarkable difference between the relative length of these three somites (especially 5 and 7) in the two species, as shown in table 3.

Table 3. Figures giving the relative length of somites 5-7 in *Eurycope ovalis* Vanh. and *E. madseni* n. sp., measured along the median and the lateral lines.

	Median line		Lateral line	
	E. ovalis	*E. madseni*	*E. ovalis*	*E. madseni*
Somite 5	3	4	15	10
Somite 6	27	24	13	14
Somite 7	14	16	8	12

The pattern of the muscles as seen through the transparent integument of somites 5 and 6 is shown in fig. 40 a.

Pleon is, when seen directly from above, exactly as long as broad (not only half as long as broad as in Vanhöffen's fig. 118 a). There is a slight bend on each side near the rounded apex. The dorsal surface is rather strongly vaulted longitudinally as well as transversely, much more than in *madseni*.

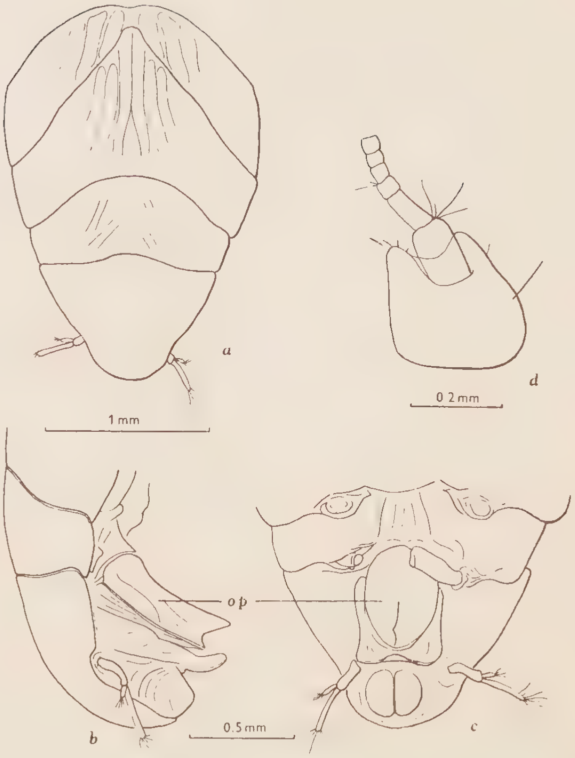

Fig. 40. *Eurycope ovalis* Vanhöffen ♀, type specimen; a, pereion somites 5-7 and pleon; b, lateral view of pleon; c, ventral view of pleon (op, operculum); d, right antenna 1.

The ventral side of the pleon is shaped in a way which seems to be unique within the genus *Eurycope* and points in the direction of *Storthyngura*. I have studied the females of the fourteen species of *Eurycope* kept in this museum without finding anything similar. In the descriptions of five more species the authors have given an illustration of the female seen from the side or from below and also in these cases the ventral pleon seems to be of the ordinary shape. In the following eleven species, however, nothing definite can be said, since the authors do not describe or figure the underside of the pleon: *E. antarctica* Vanh., *crassa* Vanh., *curta* Vanh., *frigida* Vanh., *laevis* Bened., *nobili* Rich., *pavlenkoi* Gurj., *quadrata* Barnard, *scabra* Hansen, *spinifrons* Gurj., and *sulcifrons* Barnard.

When comparing the present fig. 40 b and c with fig. 30 b of *Storthyngura benti* (p. 113) and fig. 35 b of *S. furcata* (p. 119) it will be seen that also in the present species there is a prominent keel or rather crest separating the terminal face from the operculum. Owing to the strong downward inclination of the distal end of the pleon this crest does not, however, stand at right angles to the longitudinal direction of the operculum, but has become almost parallel to it. The median part of the crest, when seen from the side (fig. 40 b), is shaped like a tongue and bent a little forwards. The uropods are inserted in a depression on each side of the dome-shaped terminal face.

Antenna 1 (fig. 40 d) is of the same general appearance as in *madseni*, but the first segment is only as broad as long, and the antero-interior corner is more prominent; the shape is very near to that of *E. cornuta* G. O. Sars. Segment 2 is relatively longer and more slender, but this may be a sexual difference like the one found in *cornuta* (Hansen 1916, pl. 12, 8 b-d).

Antenna 2 as in *madseni*.

Right mandible (fig. 41 a) has the ordinary shape of the genus, i. e. no triangular process as in *madseni*. The cutting edge has four small teeth of which two are terminal. There are several slender spines in the spine-row, but they are set so close together that they cannot be counted even at the greatest magnification. The molar process is very prominent.

Maxilliped (Vanhöffen's fig. 118 c) is considerably broader than in *madseni*. There are three coupling hooks in the right and presumably only two in the left maxilliped. The penultimate segment of the palp is unusually broad and short. The epipodite has an incision on the inner side of the apex which thus forms a conspicuous process. This is not found in any other species of *Eurycope* except in the Kermadec specimen of *nodifrons* (fig. 38 d, p. 125) where there is a similar, but much smaller, incision or rather bend but no conspicuous process.

Pereiopods. IV is totally lost and of I-III only basis is preserved. Basis of pereiopod I is somewhat longer than basis of II and III which are equally long. Pereiopods V and VI are almost identical (fig. 41 b), and VII is also of the same shape but one third smaller.

Female operculum (fig. 40 b and c) is egg-shaped in ventral view; when seen from the side it is almost rectangular and nearly three times longer than broad. The rounded protuberance found on the operculum of several other females of the species of *Eurycope* has here developed into a very prominent pointed process. On the lower surface there is a not very conspicuous keel stretching from this process towards the proximal margin.

Uropod (Vanhöffen's fig. 118 b) is long and even more slender than in *madseni*. Exopodite one third of the length of the endopodite.

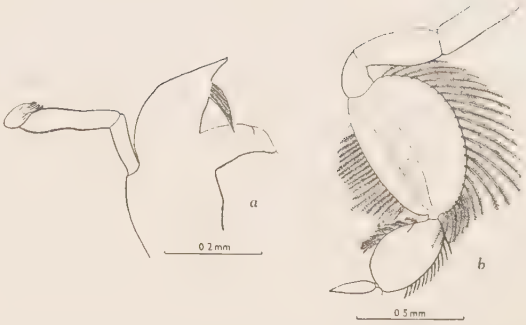

Fig. 41. *Eurycope ovalis* Vanhöffen ♀; type; a, right mandible; b, pereiopod VI.

Size: Total length is 3.2 mm, maximum width 1.6 mm.

Remarks:

In many respects this species is identical with *madseni*. The main similarities are:

1. Size and shape of head, except that no outer margin of the mandibles is visible from above or below in *ovalis*. – 2. Size and shape of pereion somites 1-4 and of epimeral plates. – 3. General appearance of somites 5-7 and of the course of the seam separating the fused fifth and sixth somites. –4. Shape of the first four segments of antenna 2 and of the squama. – 5. Shape of uropods.

The differences which are important enough to separate the two species are as follows:

1. Relative length of somites 5-7 as shown in table 3. I do not regard this point as very essential because the difference may be due to the fact that the type specimen of *ovalis* is juvenile so that these somites may not yet have obtained their final shape. – 2. Pleon is as long as broad, i. e. much longer than in *madseni*. Moreover, it has a bend on each side near the apex and is much more vaulted. On the ventral side there is in *ovalis* a crest between the operculum and the deeply downward bent terminal face while the ventral side of the pleon in *madseni* is quite flattened. – 3. First segment of antenna 1 much narrower in *ovalis*. – 4. Mandible without the strong process at the insertion of the palp and spine-row with very slender spines. –5. Maxilliped broader and with an incision near the apex of the epipodite.

The question about a relationship between the two species is rather intricate. Superficially they are very alike, even identical in shape of head and somites 1-4. On the other hand such fundamental features as shape of mandible and pleon show such pronounced difference that one might be tempted to place them even in two different genera. In my opinion the two species have been separated for such a long period that the mandibles of *madseni* and the pleon and the mandibular epipodite of *ovalis* have developed into the present shape which is unlike all other species of *Eurycope*. For some reason or other the head and most of the pereion somites have retained their original identical shape or have developed along parallel lines.

Distribution:

Known only from the Antarctic Indian Ocean (65°15′S, 80°19′E) at a depth of 3423 m.

Eurycope vicarius Vanhöffen, 1914

Eurycope vicarius Vanhøffen, 1914, p. 586, figs. 116 & 117 a-f.

Material:

Of the three specimens caught by the Gauss Expedition I have chosen the largest and best preserved female as the lectotype. This is also the specimen which was drawn by VANHÖFFEN in his fig. 116. It has half-developed marsupial plates.

Description:

Body in adults slender, three times longer than broad.

Head almost as long as broad and only a little narrower than the pereion somites. The frontal rostrum (fig. 42b) is small and concave at the end which slopes somewhat downwards as in *E. inermis* Hansen. On the antero-lateral corners the frontal seam is furnished with six short spines.

Pereion somites 1-4 (VANHÖFFEN's fig. 116) are equally broad and rather short, together a little more than two thirds of somites 5+6. In the adults the antero-lateral corners of somites 1 and 2 are rounded while in somites 3 and 4 they have a process as seen in the figure. The epimeral plates are well developed. The anterior half of each plate is pointed, and the posterior, rounded half is unusually broad so that it is clearly visible also in dorsal view.

Pereion somites 5-7 are rounded and almost smooth, with the anterior margin somewhat raised. Somite 5 is a little broader than 6, while the two somites are equally long and have their anterior and posterior margins parallel. Somite 7 is two thirds longer than 6 and has the posterior margin almost straight. The antero-lateral corners of all three somites have a broad process pointing forwards and a little upwards and furnished with a slender spine. Round the coxa especially of pereiopods V and VI there is a conspicuous ring which is clearly visible in lateral view.

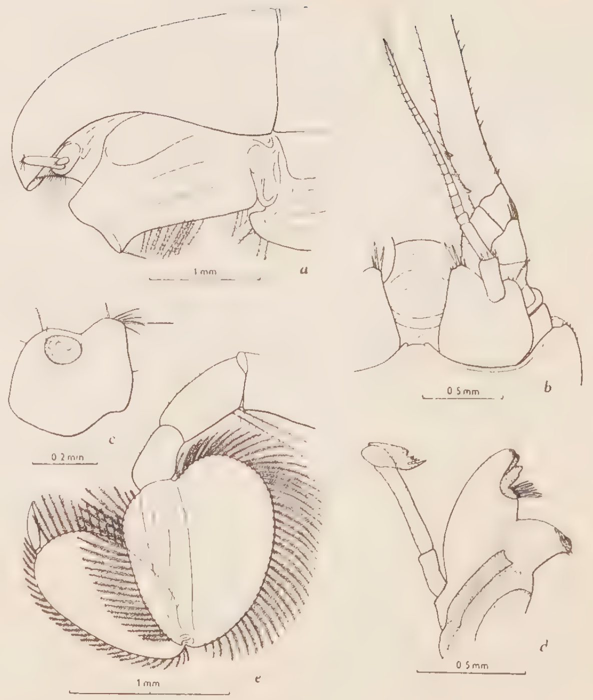

Fig. 42. *Eurycope vicarius* Vanhöffen; a, pleon and operculum of female type specimen; b, frontal projection and right antennae 1 and 2 of female type; c, left antenna 1 of male; d, left mandible of female type, seen from above; e, pereiopod VII.

Pleon is, when seen exactly from above, about as long as broad. It consists of two fused somites of which the anterior is extremely short and only one third as broad as the posterior. This is smooth and strongly vaulted both transversely and longitudinally so that the rounded apex is pointing downwards (fig. 42a). The cavity for the pleopods is almost squarish and not much smaller than the pleon.

Antenna 1 of the female (fig. 42b) has the first segment a little longer than broad, with the antero-interior corner strongly projecting and furnished with two long spines. Segment 2 is twice as long as broad, segment 3 of the same length, but only half as broad. The flagellum is a little longer than the peduncle and has about twenty segments.

As in *E. cornuta* (HANSEN 1916, pl. 12, 8b-d) there is some variation in the shape of the first segment of antenna 1. In the male (fig. 42c) it is broader than long and with considerably less projecting antero-lateral corners. Segment 2 and the rest of the antenna were unfortunately lost.

Antenna 2 has a squama which is as broad as long and is furnished with three long spines on the blunt

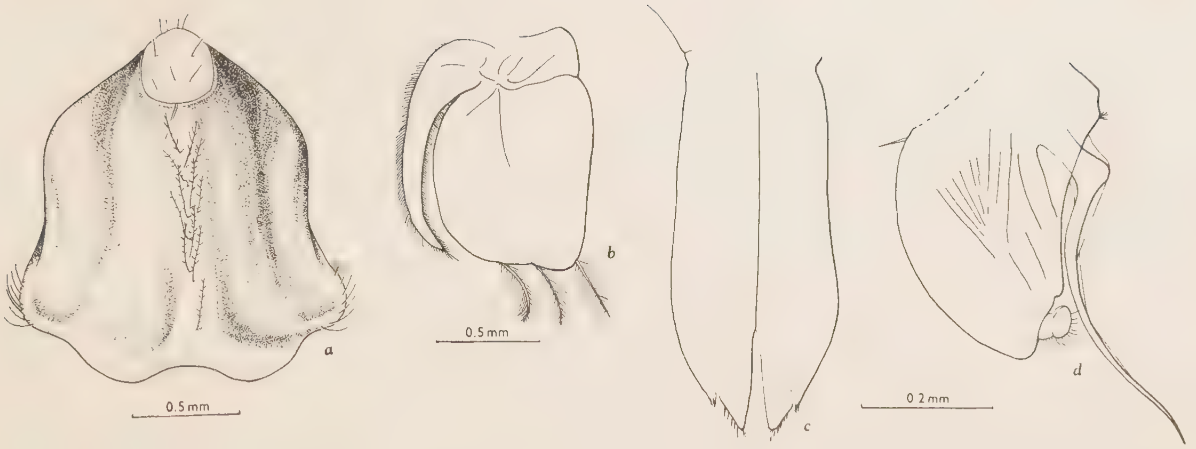

Fig. 43. *Eurycope vicarius* Vanhöffen; a, operculum of female type specimen, seen from below; b, pleopod 3 of female; c, pleopoda 1 of male; d, pleopod 2 of male.

apex. The proximal end of segment 5 seems to have a secondary segmentation (fig. 42b) lined with short, closely set hairs. Segment 5 is more than three times as long as the first four segments combined, segment 6 is again almost one third longer than 5 and the flagellum is almost twice as long as 5+6. The entire antenna 2 is exactly twice as long as the whole animal.

Left mandible (fig. 42d) has two very stout and blunt teeth on the cutting edge. The movable lacinia is much more feeble than the incisive part and has three small, blunt teeth on the end. There are six or seven spines in the spine-row and the molar process is short and stout. Along the upper surface of the proximal half of the mandible there is an oblique ridge with a very sharp edge.

Maxilliped is in accordance with VANHÖFFEN's fig. 117a. Second segment is less than one and a half times longer than broad. The epipodite has the same characteristic shape as in *cornuta, producta, brevirostris,* and *inermis,* but differs in having the projection on the outer margin broader and more rounded, as shown in fig. 44d.

Pereiopods I and III are shown on VANHÖFFEN's fig. 116; the figure is correct except that basis of all four anterior legs are equally long and slender.

Pereiopod VII (fig. 42e) has a comparatively wide propodus, which is more than half the width of carpus.

Female operculum (figs. 42a & 43a), when seen from below, is almost rectangular. The median keel ends posteriorly in a peculiar, straightly cut off area which is oval in shape and unique within the genus. It substitutes the rounded protuberance found in many other *Eurycope* species, for instance *inermis* and *nodifrons.* Besides the median keel there are on the lower surface two longitudinal, low convexities, and the anterior margin as well as the rounded corners are also somewhat raised. (Concerning variation in female operculum see below).

Pleopod 3 of female (fig. 43b) has the second segment almost squarish.

Male operculum (of the only male) had been mounted on a slide and was not very well preserved. The outline of *pleopoda 1* is given in fig. 43c which shows that their length is 2.3 times their total width. The distal end has two lobes, but no more details than shown in VANHÖFFEN's fig. 117d could be seen. *Pleopod 2* (fig. 43d) is almost semicircular in shape with a very long and slender copulatory organ which has the segmentation very near the base of the pleopod.

Uropod (fig. 42a) with a short and very broad basal segment crowned with a row of long setae. Endopodite three times as long as exopodite.

Size: The largest female (with half-developed marsupial plates) is 8.8 mm long and 2.8 mm broad. The male is 5.0 × 1.6 mm.

Variation:

Together with the female and male one more female was caught which is probably juvenile and differs from the female type in having the anterolateral corners of pereion somites 3 and 4 rounded. Further, the shape of operculum is oval rather than squarish. Almost in the centre of its lower surface the median keel divides into two divergent keels. The triangular area between these corresponds to the characteristic oval, straightly cut off area in the adult. The shape of the first segment of antenna 1 is half way between that of the adult female and male. In all other respects the two females are identical.

Remarks:

Vanhöffen pointed out the similarity between *vicarius* and *cornuta* G. O. Sars. Still greater is, however, the accordance with *inermis* (Hansen 1916, p. 142-144 and pl. 13, 2 a-i). A study of the rich material of this species in the Copenhagen Museum[1] shows that the shape of head, frontal projection, and pereion somites is quite identical except that the body of *inermis* is relatively broader than that of *vicarius*. The pleon is also somewhat broader and more rounded posteriorly in *inermis*, but its height is the same in the two species. *E. inermis* has more produced antero-lateral corners on the first segment of antenna 1, its shape is the same in the two sexes, and segment 3 is comparatively longer. The mandibles of *inermis* are longer and more slender, the cutting edge has three-four rather pointed teeth instead of the two stout and blunt ones in *vicarius*, etc. The varying shape of the epipodites of the maxillipeds is shown in fig. 44 b and d.

The greatest difference is to be found in the shape of the female and male opercula. The former, when seen from below, is triangular in shape in *inermis* and almost squarish in *vicarius*, and the characteristic oval area on the median distal part of the latter is substituted by a blunt, projecting widening of the median keel in *inermis*, as shown in Hansen's fig. 2 k. At the same time, the median keel in *inermis* is much sharper and quite naked. The male pleopoda 1 in *inermis* are narrower and constricted in the middle, being broadest at the base. The terminal lobes seem to be almost equal in the two species. Much differing are, however, the second pair of pleopods. In *vicarius* the plate is almost semicircular with a very long copulatory organ. In *inermis* the shape of the plate is almost triangular with a broad and rounded outer and a pointed distal corner which has concave margins; the copulatory organ has the second segment only half as long as the plate and it only reaches the apex (Hansen's fig. 2 h).

Thus, the differences seem to me to be sufficient to distinguish the two species which must, however, be very closely related.

From *brevirostris* it differs in being much more slender, in shape of pleon, rostrum and epipodite of maxilliped as well as in the very different female and male opercula and uropods.

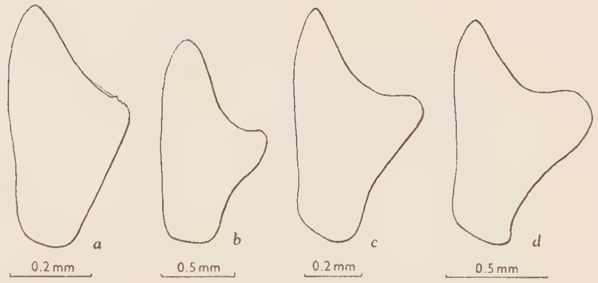

Fig. 44. Epipodite of left maxilliped in four species of *Eurycope;* a, *E. gaussi* n.sp.; b, *E. inermis* Hansen; c, *E. galatheae* n.sp.; d, *E. vicarius* Vanhöffen.

The reason for separating *vicarius* from the two new species, *gaussi* and *galatheae*, will be discussed in connexion with the description of these species.

Distribution:

Known from one locality only in the Antarctic Indian Ocean (65°15'S, 80°19'E) at a depth of 3423 m.

Eurycope brevirostris Hansen, 1916

Eurycope vicarius Vanhöffen, 1914, p. 586 (pars).
Eurycope brevirostris Hansen, 1916, p. 146, pl. 13, 5 a-i.

When studying the material labelled by Vanhöffen as *E. vicarius* it struck me that not only were the five smaller specimens relatively broader than the adult, but the pleon was at the same time broader than long, semicircular in shape and flattened, the frontal rostrum was comparatively longer, the female operculum differently shaped, and the exopodite of the uropod was two thirds of the endopodite. These specimens could therefore hardly belong to *vicarius*, nor could they be reckoned to the two other antarctic *Eurycope* species of a similar appearance *(crassa* and *antarctica)* because of shape of rostrum, maxilliped, etc.

By comparison with the type material of Hansen's *E. brevirostris* from the Ingolf Expedition these five antarctic specimens show a remarkable agreement with this species, so close that I could see no reason for describing them as a new species.

The ratio between length and width of *vicarius* and the five specimens of *brevirostris* from the Gauss as well as ten from the Ingolf is given in table 4. It is seen that while *vicarius* is at least three times as long as broad, *brevirostris* is at most 2.7

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[1] As part of the examination of the material of *E. inermis* Hansen I have chosen a female, 8.3 mm long, from Ingolf St. 120 (with altogether 7 females and 1 mutilated male) and 1 male, 9.2 mm long, from Ingolf St. 103 (with altogether 5 females and 5 males) as lectotypes; they have been deposited in the type collection of the Copenhagen Museum.

Table 4. Relative length and width in *Eurycope vicarius* Vanh. and *E. brevirostris* Hansen from the Gauss and the Ingolf Expeditions.

	Sex	mm		Length/width	
		Length	width	Total animal	pleon
E. vicarius	♀	8.8	2.8	3.0	1.1
	♂	5.0	1.6	3.1	> 1[1]
	♀	3.7	1.2	3.2	1.1
E. brevirostris Gauss-Exp.	♀	2.6	1.0	2.6	0.8
	?	2.1	0.9	2.3	0.8
	♀	1.7	0.9	1.9	0.8
	♀	1.6	0.6	2.7	0.8
	♀	1.4	0.8	1.8	0.7
E. brevirostris Ingolf-Exp.	♀[2]	2.7	1.2	2.2	0.7
	♀[3]	2.6	1.1	2.3	0.7[4]
	♀[3]	2.5	1.1	2.2	0.7
	♀[2]	2.3	1.1	2.0	0.7
	♂	2.2	1.0	2.2	0.7
	♂	2.1	1.0	2.2	0.6
	♂	1.9	0.9	2.1	0.7
	♀	1.8	0.8	2.1	0.7
	♂	1.6	0.8	2.1	0.6
	♂	1.3	0.6	2.2	0.6

1. Pleon a little mutilated so that an exact ratio cannot be given.
2. With fully developed marsupial plates.
3. Ovigerous.
4. This female from Ingolf St. 138 was chosen as lectotype; it has been deposited in the type collection of the Copenhagen Museum.

times longer than broad and preferably only twice as long as broad. The variation in length/width is, however, considerably greater in the Gauss than in the Ingolf material of the latter species.

The difference between *brevirostris* and *gaussi* n.sp. is discussed below.

A careful study of the Gauss and the Ingolf materials of *brevirostris* revealed the following differences:

1. Pleon a little more rounded in the Gauss than in the Ingolf material even if it in direct dorsal view is somewhat more rounded in the latter material than can be seen from Hansen's fig. 2a.

2. Antenna 1 has the antero-interior corner on segment 1 somewhat more projecting in the Gauss material (almost as much as in *inermis).*

3. Mandibles are – although of the same type – somewhat different in stoutness, the Gauss mandible being more slender, especially the molar process, and with three spines in the spine-row instead of four in the Ingolf specimens.

4. Carpus of pereiopods VI and VII a little more slender in the Gauss material.

5. Exopodite of uropod only two thirds of endopodite in the Gauss specimens – instead of four fifths in the Ingolf material.

As a matter of fact, nothing definite can be said about the identity before males have been obtained from the Antarctic. However, the females from the North Atlantic and from the Antarctic agree in all major features (frontal projection, relative size of pereion somites and pleon, shape of mandibles and maxillipeds, shape of operculum). I do not, therefore, hesitate to regard them as belonging to the same species or at any rate to consider them very close to each other.

Distribution:

North Atlantic (between lat. 61° and 66° N and long. 8° and 28° W), from 887 to 1505 m depth and at temperatures from 4.5°C to ÷ 0.6°C; Antarctic Indian Ocean (65°15′S, 80°19′E) at 3423 m depth.

Eurycope gaussi n. sp.

Eurycope vicarius Vanhøffen, 1914, p. 586 (pars).

Material:

When examining the material labelled *Eurycope vicarius* Vanh., which I had borrowed from the Berlin Museum, I found that one specimen, caught at the Gauss Station of the German Antarctic Expedition 1901-1903, on 6. December 1902 could hardly belong to this species. Nor was it identical with any other *Eurycope* species and therefore had to be described as new.

Description:

Body (fig. 45a) of a peculiar shape, the anterior half being one fourth narrower than the posterior and asymmetrically connected with it. At first it seemed probable that the animal had been captured while in moult,[1] but after having cleared it with methyl benzoate I could see no trace of a new integument under the old one. On the contrary, the clearing showed that the animal, when seen from below (fig. 45b), in a remarkable way had healed what seems to have been a former injury. In fig. 45b is indicated the pattern of very fine stripes on the inte-

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[1] Hult (1942, p. 131) observed moulting in *Eurycope mutica.* The integument of the posterior part was shed first and 24 hours later the head and the four anterior somites were moulted.

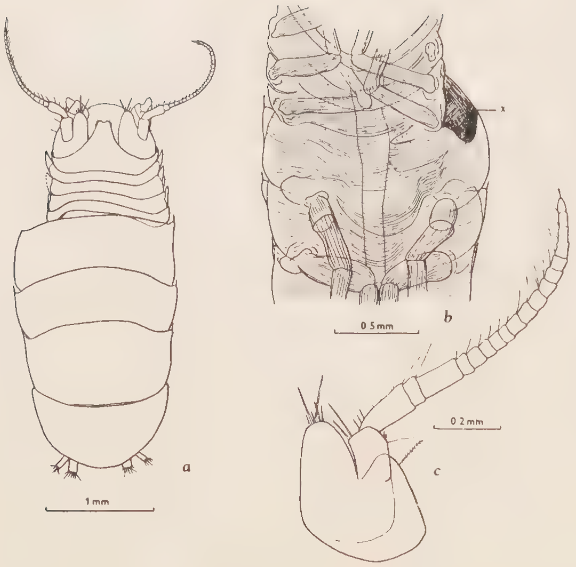

Fig. 45. *Eurycope gaussi* n. sp. ♂; type specimen; a, dorsal view; b, pereion somites 2-6 from below; c, right antenna 1.

gument of the lower surface. Their irregular course on the left part (right in the figure) of pereion somite 5 shows the locality of the supposed injury. On the left side of the animal the antero-lateral margin of somite 5 is strongly vaulted over the postero-lateral margin of somite 4, leaving a rounded cavity the bottom of which is covered with an integument without any pattern (× in fig. 45b). According to the asymmetrical structure the intestine has a bend at the transition between somites 4 and 5. Nothing seems to speak in favour of the first four somites being normally much more narrow than the three succeeding ones, like in *E. beddardi* (Bonnier 1896, pl. 33, fig. 3a). Owing to the peculiar shape of the body it is impossible to say anything exact about the ratio between length and width. In the present specimen it is 2.3, while in the type of *vicarius* it is 3.0. It is, however, more correct to compare length/width of pereion somites 5-7 + pleon with the same ratio in *vicarius*. This gives a ratio of 2.2 in *vicarius* and only of 1.8 in *gaussi* which seems to identicate that also normally shaped specimens of the latter species are relatively broader than *vicarius*.

Head with a conspicuous frontal projection the dorsal surface of which is slightly concave to near the apex, where it becomes groove-shaped and continues in a median ridge which runs vertically downwards to the clypeus, at right angles to the horizontal rostrum. Each of the raised margins has three small spines near the bend. Laterally, the distance between the frontal seam and the anterior margin of somite 1 is much shorter than in *vicarius*.

Pereion somites 1-4 are equally long and increasing in width from 1 to 4. They are shorter than in most other species of *Eurycope*. The posterior ones have the front margin fairly convex. Epimeral plates of somites 3 and 4 are rather small.

Pereion somites 5-7 are strongly vaulted and quite smooth. Somite 5 is a little longer than 6 and two thirds as long as 7. The antero-lateral corners as in *vicarius*, but each with a slender spine.

Pleon consists of an extremely short anterior segment and a large posterior one which is only three fifths as long as broad, when seen exactly from above. Towards the end it is bent as much downwards as in *vicarius*. In direct dorsal view the anterior margin is almost straight. The cavity for the pleopods is rounded and one third longer than broad.

Antenna 1 (fig. 45c) has on the first segment a very projecting antero-interior lobe which is longer than broad. There is no visible outer lobe. The whole segment is somewhat longer than broad. The third segment is broader than usual, almost as broad as the second. The flagellum has 17 segments.

Antenna 2 has a small squama which is shorter than half the width of segment 3. The majority of the antenna is lost.

Left mandible has a very broad cutting edge with two rounded teeth which are seen from the side in fig. 46a. The movable lacinia is also broad and has four minute tubercles along the straightly cut off, distal end. There are only about four spines in the narrow spine-row. The molar process is very stout. There is the same sharp-edged ridge on the upper surface of the mandible as in *vicarius*. The palp is stouter than is usually the case in *Eurycope*. Its first segment is broad and furnished with a row of short spines along the lower margin.

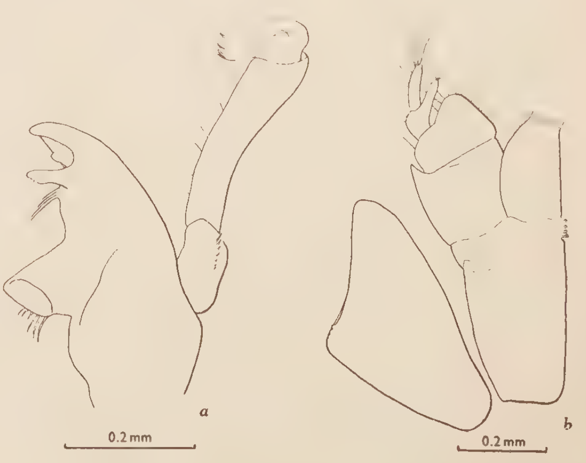

Fig. 46. *Eurycope gaussi* n. sp. ♂; a, left mandible; b, right maxilliped.

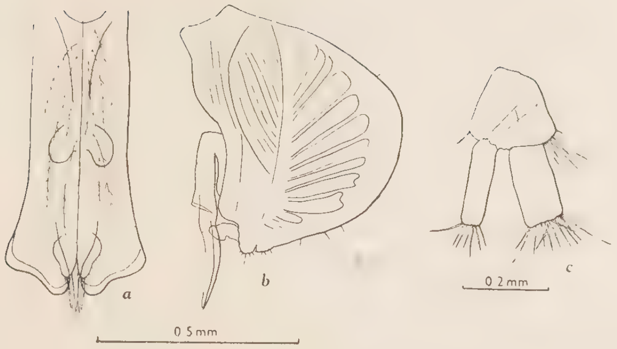

Fig. 47. *Eurycope gaussi* n.sp. ♂; a, pleopoda 1 from outside (ventral view); b, pleopod 2; c, uropod.

Maxilliped (fig. 46 b) is very near to that of *vicarius*, but the epipodite is rather different (fig. 44 a). The projection on the outer margin is small and subacute and of the same shape as in *producta*. On its distal margin there are a few, low teeth.

Pereiopods are all present. II, III and IV are quite equal and differ from I in having propodus twice as long and dactylus four times as long, while the proximal segments are almost equally long. A comparison between pereiopods I and III in *vicarius* and *gaussi* shows that merus and dactylus of both legs are about one and a half times longer in *gaussi*, while ischium of pereiopod III is one and a half times longer in *vicarius*. The remaining segments show slight differences only, and the same applies to the natatory legs.

Male pleopoda 1 (fig. 47a) are subparallel, with projecting, rounded corners near the distal end. This is somewhat raised and split up in two pairs of lobes, a broader outer pair which is naked and a somewhat narrower and shorter median pair which is furnished with a bunch of fine hairs. Halfway between base and apex a pair of low, hook-like protuberances is found on the dorsal (inner) side of the pleopods. The surface of the pleopods has several scattered, long and feathered hairs.

Pleopod 2 (fig. 47b) is almost as broad as long, with the inner margin of the plate somewhat concave and a rounded projection just proximal to the slender coupling hook. The copulatory organ is short and thick, the second segment being only about half as long as in *vicarius*.

Uropod (fig. 47c) has a broad and almost triangular basal segment which is shorter than the equally long endo- and exopodites. The former is almost twice as broad as the latter.

Size: Total length is 3.3 mm and largest width 1.4 mm.

Remarks:

Some of the differences between *gaussi* and *vicarius* were pointed out in the above description. They are – together with other differences – summarized in table 5. In shape of body, epipodite of maxilliped, second male pleopod, and the uropod *gaussi* resembles *brevirostris*, but the vertical ridge connecting the rostrum and clypeus, the short lateral parts of the head, the downward bent distal part of the pleon, the shape of antenna 1, the palp of the maxilliped, and especially the very differently shaped male pleopod 1 serve to separate them. Also *inermis* and *complanata* have similarities with *gaussi* in shape of body, especially the pleon, and in other features. Here again, however, pleopoda 1 are quite different, and the same applies to the mandibles, the uropods, etc., and to pleopod 2 in *inermis*.

Distribution:

Antarctic Indian Ocean (66°02′S, 89°38′E) at 385 m depth.

Table 5. Differences between *Eurycope vicarius* Vanhöffen, *E. gaussi* n. sp., and *E. galatheae* n. sp.

	E. vicarius	*E. gaussi*	*E. galatheae*
Ratio between length and width of body	3.0–3.2	c. 2.3	3.0
Ratio between length and width of pleon	1.0	0.8	1.0
Cavity for the pleopods	almost squarish	rounded	almost squarish
Lateral projection on epipodite of maxilliped	big, very broad	small	big, broad
Relative length of merus and dactylus of prp. I	0.7	1.0	–
Relative length of merus and dactylus of prp. III	0.7,0.6	1.0	–
Relative length of ischium of prp. III	1.0	0.6	–
Distal lobes on male pleopoda 1	inner lobe the longer	outer lobe the longer	equally long
Second segment of copulatory organ	longer than plate	$^2/_3$ of plate	$^3/_5$ of plate
Exopodite of uropod	$^1/_3$ of endopodite	as long as endopodite	$^1/_4$ of endopodite

Eurycope galatheae n. sp.

Material:

St. 651, Kermadec Trench (32°10'S, 177°14'W), 6960-7000 m, 16. Febr. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 1 male without head + posterior half of one more specimen without pleopods.

Description:

Body (fig. 48a & b) as slender as in *vicarius,* i. e. about three times longer than broad, provided the missing head has about the same dimensions as in *vicarius.*

Head absent, only the maxillipeds were preserved.

Pereion somites 1-4 of the same length, but increasing in width from 1 to 4. Antero-lateral corners of the anterior somites rounded and all corners without processes. Epimeral plates of moderate size.

Pereion somites 5-7 like in *vicarius.*

Pleon is as long as broad and somewhat higher than in *vicarius.* It has the distal part bent downwards. The cavity for the pleopods is almost squarish, only slightly broader than long.

Maxillipeds are both without the palp. The epipodite (fig. 44c, p. 132) resembles that of *vicarius,* but the lateral lobe is narrower.

Pereiopod VII (fig. 49a) is the only leg present. Carpus is like that of *vicarius,* but propodus is somewhat narrower and the lateral margins are subparallel.

Male pleopoda 1 (fig. 49b) have a conspicuous convexity not far from the distal end which is split up in two equally long lobes (as in *furcata).* The outer lobe is somewhat broader than the inner one; both lobes have a terminal tuft of thin hairs. Like in *gaussi* there is on the dorsal (inner) side of the pleopods a pair of low, hook-like protuberances halfway between the base and the apex.

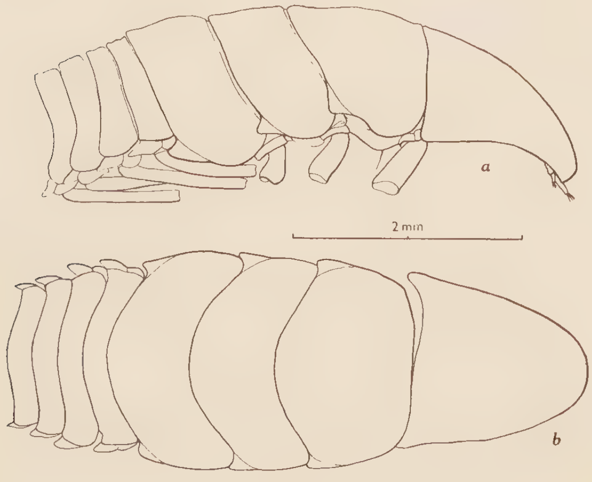

Fig. 48. *Eurycope galatheae* n. sp. ♂; type specimen from the Kermadec Trench, 7000 m; a, lateral view; b, dorsal view.

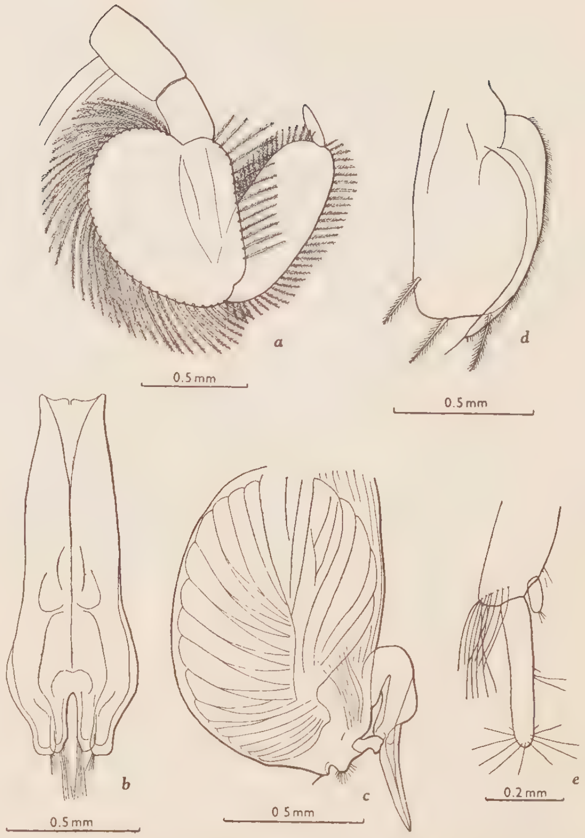

Fig. 49. *Eurycope galatheae* n. sp. ♂; a, pereiopod VII; b, pleopoda 1; c, pleopod 2; d, pleopod 3; e, uropod.

Pleopod 2 (fig. 49c) is almost oval in shape. On the inner, distal corner there is a rounded projection with thin hairs (as in *gaussi).* The copulatory organ is very short and thick, much shorter than in *vicarius* and *brevirostris* and even shorter than in *gaussi.*

Pleopod 3 (fig. 49d) has both rami longer and narrower than in *vicarius.*

Uropod (fig. 49e) has a rather long basal segment, furnished with a distal row of long hairs. The exopodite is only one fourth of the endopodite.

Size: Without head *E.galatheae* is 5.0 mm long. Since the length of the head in most *Eurycope* species is about one sixth of the whole length, the total length of the present male of *galatheae* was probably about 5.8 mm; the largest width is 1.9 mm.

Remarks:

It was with some hesitation that I based the description of a new species on a specimen without head. However, the unique shape of the male pleopods separates *galatheae* from any hitherto known species of *Eurycope*. Notwithstanding the absent head this species seems to be most nearly related to *vicarius*. Some of the differences were pointed out in the above description. A summary of the variation between *vicarius, gaussi* and *galatheae* is given in table 5.

Distribution:

So far known only from the Kermadec Trench NE of New Zealand, 6960-7000 m, 1.3°C.

2. Anthuridea

While all the hitherto mentioned Isopoda belonging to the trench fauna are representatives of the sub-order Asellota the following species is the only representative of Anthuridea, a sub-order which is considerably less abyssal than Asellota.

ANTHURIDAE

Leptanthura G. O. Sars

Leptanthura G. O. Sars, 1899, p. 47.
Leptanthura G. O. Sars, BARNARD, 1925, p. 149.

In his revision of the Anthuridae in 1925 BARNARD gave a good diagnosis of this clearly defined genus. It was based on SARS' original description with some alterations, caused by the greater number of species which BARNARD included in the genus. The present species fits well within the limits of *Leptanthura* except for two characters: firstly, antennae 1 do not have a brush-like flagellum in the male; this is, however, neither the case in *L. truncata* Richardson nor in *chiltoni* (Beddard); in both, the first antennae seem closely to resemble those of the present species; nor in *glacialis* Hodgson in which the flagellum is rudimentary. Secondly, the exopodites of the uropods are much narrower in the present species in which they do not meet in the middle. BARNARD (1925, p. 150) states in his description of *L. orientalis* that the exopodites are narrower than usual, but since he gives no figure and the uropods are missing in the type specimen (kept in the Copenhagen Museum) it is impossible to tell whether they meet in the middle or not in *orientalis*. I have not found these two varying characters of generic significance; in shape of body and pleon, of mouth-parts, pereiopods, etc. the present species agrees in almost all details with the other species of *Leptanthura*.

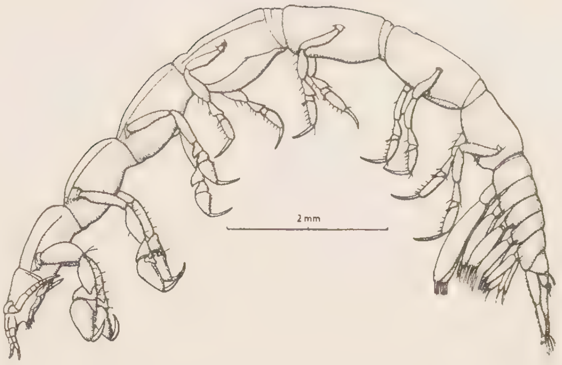

Fig. 50. *Leptanthura hendili* n. sp. ♂; type specimen from the Banda Trench, 6580 m.

Leptanthura hendili n. sp.

Material:

St. 499, Banda Trench (5°21'S, 131°17'E), 6580 m, 24. Sept. 1951. Gear: Petersen grab (bottom sampler) 0.2 sq.m. Bottom: greenish clay. Bottom temperature: 3.5°C. – 1 complete male.

Description:

Body (fig. 50) very elongated, almost fifteen times longer than broad.

Head (fig. 51 a) a little longer than broad with a straight posterior margin and a tiny rostrum at the base of the second pair of antennae. Eyes absent.

Pereion somites are narrower than in all other species, but of almost the same relative length as in

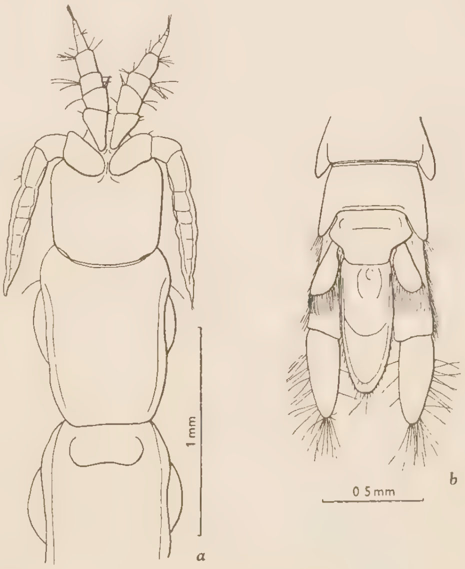

Fig. 51. *Leptanthura hendili* n. sp. ♂; a, head, pereion somites 1-2, and antennae; b, pleotelson and uropoda.

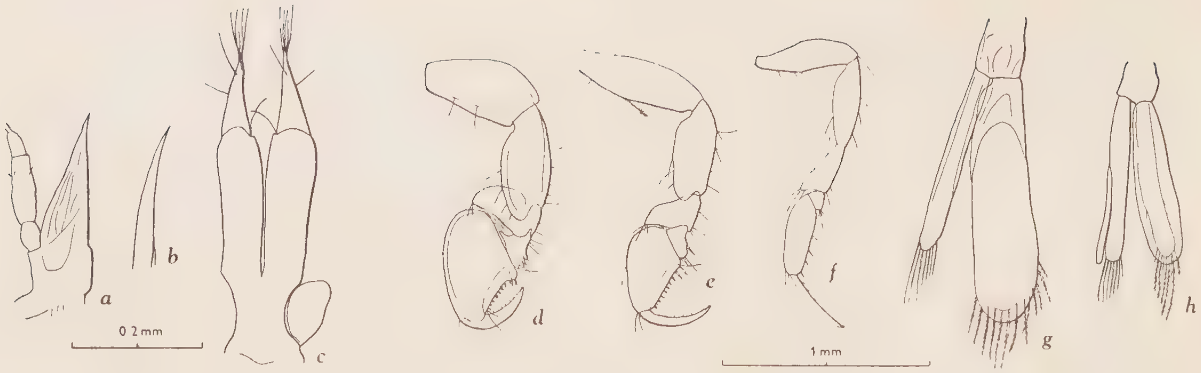

Fig. 52. *Leptanthura hendili* n. sp. ♂; a, right mandible; b, right maxilla; c, maxillipeds; d-f, pereiopoda I,II, and VII; g-h, pleopoda 1 and 2.

these, except *L. truncata*. Somites 1 and 7 are equally long, 2 is somewhat longer than these, 3 somewhat longer again, 4 and 6 equally long and one and a half times longer than 1 and 7; somite 5, finally, is the longest of all, i. e. almost twice as long as 1 and 7. The somites are broadest at the insertion of the pereiopods. A low, dorso-lateral keel is found on the four anterior somites. There are no ventro-lateral spines or processes on the posterior somite as in *truncata* and *tenuis*.

Pleon (telson included) is a little shorter than pereion somites 6+7. Like in *glacialis* the first and fifth somites are equally long and a little longer than those in between. When seen from above (fig. 51b) the rounded epimera of each of the first five somites are clearly visible.

Telson is two and a half times longer than broad, slightly decreasing in width towards the rounded apex which has no notch. The telson thus differs from all the other species except *thori*, but it has no tuft of setae apically, only two moderately long setae.

Antenna 1 (fig. 51a) is somewhat longer than the head. The number of segments amounts to about ten only, but cannot be stated exactly. The antenna is practically naked, as mentioned above.

Antenna 2 (fig. 51a) has five segments in the peduncle. The second is the largest, the fifth the narrowest. The flagellum is very short and consists of four segments, decreasing in length towards the end. The shape of the antenna seems to be very near to that of *truncata* and especially to that of *chiltoni*, both of which also have antenna 1 very similar to the one found in *hendili*.

Mandible (fig. 52a) was previously described only in *tenuis* G. O. Sars and *laevigata* (Stimpson); in *hendili* it differs from these in being regularly triangular. The palp is equal in the three species, i. e. with segment 2 more than twice as long as the almost equally long segments 1 and 3 and with two terminal setae.

Maxilla (fig. 52b) is almost as in *tenuis* (SARS 1899, pl. 20).

Maxilliped (fig. 52c) is of the typical shape of the genus, with three segments of which the second is by far the longest and has subparallel margins, except at the base where there is a concavity for the rounded epipodite.

Pereipod I (fig. 52d) has almost the same shape as in *laevigata* (= *faurei*, BARNARD 1914, pl. 29B) and *glacialis*, i. e. with an exceedingly large and almost rectangular propodus. The rather scarce equipment with setae is also practically identical in *glacialis* and *hendili;* especially the palm of propodus has exactly the same row of highly specialized spines like those described by HODGSON (1910, p. 10) and aptly figured by MONOD (1926, fig. 44C). They resemble a bunch with a filiform seta which also in *hendili* seems to be inserted laterally to the apical tooth (fig. 53a). There are more short setae along the inner margin of dactylus in *hendili* than in *glacialis*.

Pereiopod II (fig. 52e) has a shape which is between that of *glacialis* and *tenuis*, i. e. the propodus is not nearly so rectangular (or even quadrangular) as in *glacialis*, nor is it so narrow and pointed as in *tenuis*. However, the equipment with setae and bunch-shaped spines on propodus (fig. 53b) is very much the same in *glacialis* and *hendili*.

Pereiopod VII (fig. 52f) is somewhat more slender than in the three other species in which it was previously figured. There are four short spines on the inner margin of propodus in this pereiopod as well as in the three preceding ones.

Pleopod 1 (fig. 52g) is considerably longer and narrower than in *tenuis*, especially the inner ramus. The outer ramus is four times longer than broad and almost three times as broad as the inner ramus.

Pleopod 2 (fig. 52h) is shorter in proportion to

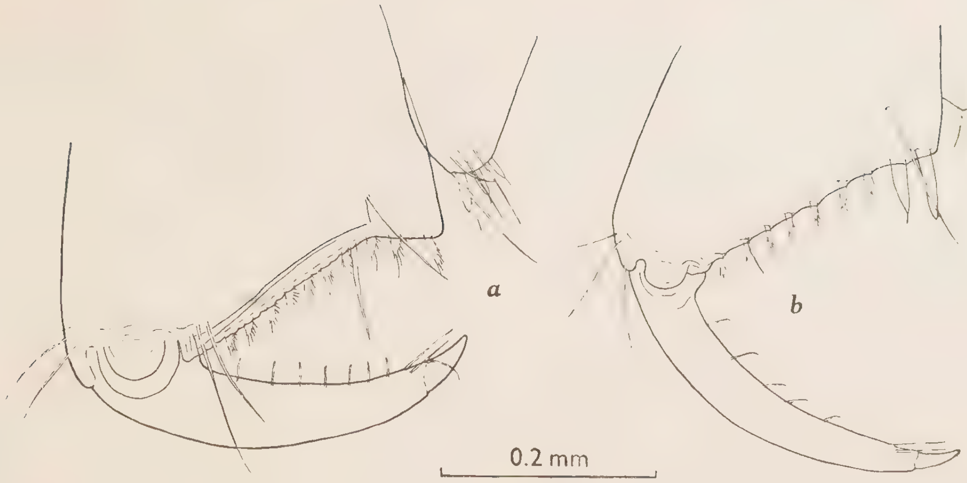

Fig. 53. *Leptanthura hendili* n. sp. ♂; a-b, inner margin of propodus and dactylus of pereiopods I and II.

pleopod 1, than is the case in *tenuis*. The shape is almost equal, the only difference being that the inner ramus is as long as the outer in *hendili*.

Uropod (fig. 51 b) has the endopodite somewhat longer than the telson. The second segment is shorter and a little narrower than the first and is rounded apically; it is shaped very much as in *tenuis*, but there are only a few scattered setae along the inner margin. The exopodite is short and narrow, only about half as long as the first segment of the endopodite; its width is two thirds of its length. Along the distal and inner margins are some very long and slightly plumose setae.

Size: Total length (to end of telson) is 11.3 mm and greatest width is 0.8 mm.

Remarks:

This species cannot be confused with any other species of *Leptanthura*, the shape of antennae 1, pleopods, telson, and especially the small exopodites of the uropods clearly separating it from the other species. It seems to be most closely related to *glacialis* with which it agrees in shape of pleon and pereiopod I, and in shape and number of the peculiar spines on propodus of pereiopods I and II. On the other hand, it greatly differs from *glacialis* in the shape of the telson (which resembles that of *thori)* and the antennae (which are like those of *chiltoni* and *truncata)*. Most of the other species of *Leptanthura* are, however, imperfectly described, and the range of variation within the single species of the genus is practically unknown so that it is still impossible to say anything definite about the relationship of *hendili*.

This species has been named after Mr. LEIF B. HENDIL, Secretary General to the Danish Expedition Fund.

Distribution:

So far known only from the Banda Trench west of New Guinea, at a depth of 6580 m and a temperature of 3.5°C.

C. GENERAL REMARKS

1. The deep-sea element of the Isopoda

Till now ten species of Isopoda have been described from depths greater than 6000 m[1], i. e. they are true hadal[2] species. Besides, three more species have representatives which have been able to penetrate into the hadal zone.

It might seem surprising that no less than twelve of these altogether thirteen species belong to the sub-order Asellota. However, in his great work on the deep-sea Isopoda of the Ingolf Expedition HANSEN (1916) recorded altogether 59 species as representatives of the five sub-orders Flabellifera, Gnathiidea, Anthuridea, Valvifera, and Epicarida, while all the remaining 105 species belonged to the Asellota.

The same predominance of Asellota in the deep-sea appears from a list of the species of Isopoda occurring at depths greater than 3000 m, given by NORDENSTAM (1955, p. 212). This list includes altogether 41 Isopoda. In my opinion the following revisions and amendments are, however, necessary: The pelagic *Paramunnopsis oceanica* (Tattersall) was taken twice by the German Antarctic Expedition during vertical hauls from 3000 m depth to the surface; therefore it should be cancelled in a list of isopods from depths beyond 3000 m.[1] On the other hand, the list does not include the following eleven bottom-living species: Caught by the U.S.S. Albatross Expedition: *Janira pulchra* (Rich.) (3230 m), *Janirella lobata* Rich. (3230 and 3190 m), *Haploniscus excisus* Rich. (3230 m), *Heteromesus spinescens* Rich. (3340 m), *H. granulatus* Rich. (3230 m); species caught by the German Antarctic Exp.: *Janthopsis nodosa* Vanh. (3420 m), ? *Microprotus antarcticus* Vanh. (3400 m), and *Haploniscus antarcticus* Vanh. (3400 m); caught by the German Plankton Exp.: *Iolanthe decorata* Hansen (4000 m); caught by the Travailleur and the Talisman: *Heteromesus similis* Rich. (3000 m) and *Pseudanthura lateralis* Rich. (3200 m). Finally, the present report has – besides describing the hadal species – extended the vertical range of the following species beyond 3000 m: *Storthyngura pulchra* (Hansen) (to 6620 m), *Eurycope nodifrons* Hansen (to 7000 m), and *E. brevirostris* Hansen (to 3420 m).

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[1] One species from the Swedish Deep-Sea Expedition (NORDENSTAM 1955) and nine from the Galathea.

[2] The term hadal has been adopted for all members of the real trench fauna; the abyssal fauna is found between about 6000 m and about 3000 m (the latter limit also depending on the temperature being 4°C. or less).

According to this revision of Nordenstam's list, and including the hadal species, the various sub-orders are represented by the following numbers at these great abyssal and hadal depths:

Asellota: 53 species
Flabellifera: 2 –
Anthuridea: 3 –
Valvifera: 4 –

In other words, the Asellota constitute 86% of the Isopoda from depths greater than 3000 m.[2]

It is remarkable that the Anthuridea, a sub-order with principally littoral species and genera, includes a hadal species. However, firstly the sub-order counts two other species from depths greater than 3000 m and two more from depths between 2000 and 3000 m, and secondly it must still be taken into account that this being the very first major attempt at making known the hadal isopod fauna it is very likely that later investigations will find some representatives of the other sub-orders as well.

Within the Asellota nine genera had beforehand two or more representatives beyond 3000 m. It is interesting that only one of the hadal species belongs to a genus of its own (*Bathyopsurus* from the Swedish Deep-sea Expedition). All the other eight species belong to four of the nine genera with two or more abyssal species. This means that the already acknowledged deep-sea nature of these four genera has now become still more emphasized.

2. The distribution of the hadal genera and species

Vertical distribution and range of temperature of the genera found in the hadal zone.

In the following it is attempted to make a survey not only of the actual bathymetrical range of all the species belonging to genera with hadal representatives, but also of the range of temperature at which they occur. In some cases records of temperature were given by the expedition which collected the animals, and even if records older than about 40-50 years are not very reliable they should be exact enough for biological purposes. In other cases it has been necessary to acquire information about the temperatures from hydrographical results of other expeditions working in the same area. These records were taken from Schott (1902, 1926 & 1935), Drygalski (1927), Schmidt (1929), Thomsen (1937), and Ekman (1953). All such records as well as old records from the actual locality have been printed in italics in the following tables.

Ischnomesus.

Certainly the most homogeneous and best defined group within the Asellota is the Ischnomesini. I have therefore found it useful to include not only *Ischnomesus* in the table below, but also the other three genera of Ischnomesini. In the table is included the yet undescribed *Ischnomesus* spp. from the Galathea Sts. 663 (Kermadec Trench, 4410 m) and 575 (Tasman Sea, 3710 m), which were mentioned on p. 97.

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[1] The Epicarid *Notophryxus longicaudatus* Vanh., *Microniscus ornatus* Vanh., and *Asconiscus simplex* G. O. Sars as well as *Paramunnopsis spinifer* (Vanh.) were also taken by the German Antarctic Exp. under the same conditions as *P. oceanica*, but are not included in Nordenstam's list. Nor are the two Epicaridea *Holophryxus giardi* and *Arthrophryxus beringanus* (Richardson 1908 c) included; they were taken by the U. S. S. Albatross Expedition as parasites on *Gennadas borealis* Rathbun and *Eucopia australis* Dana, respectively, at a depth of 4900 m. In my opinion these two isopods should also be disregarded, since it is almost certain that the two species of prawns occur above 3000 m depth and thus have been caught while hauling the trawl from the very great depths.

[2] Also the Russian deep-sea expedition to the Kurile-Kamtchatka Trench found exclusively Asellota at the greatest depths at which Isopoda were dredged, 7200-8400 m (Zenkevitch *et al.* 1954).

Table 6 shows that except for *Ischnomesus bispinosus – Heteromesus greeni* and *I. spärcki – I. bruuni* the species of Ischnomesini range from about 1000 m to about 3000 m, according to our present knowledge. Apart from the two first named species none seems to occur at temperatures higher than some 5°C.

Table 6. Vertical distribution of Ischnomesini.
Available temperatures are given in °C. (the not fully reliable ones are in italics).

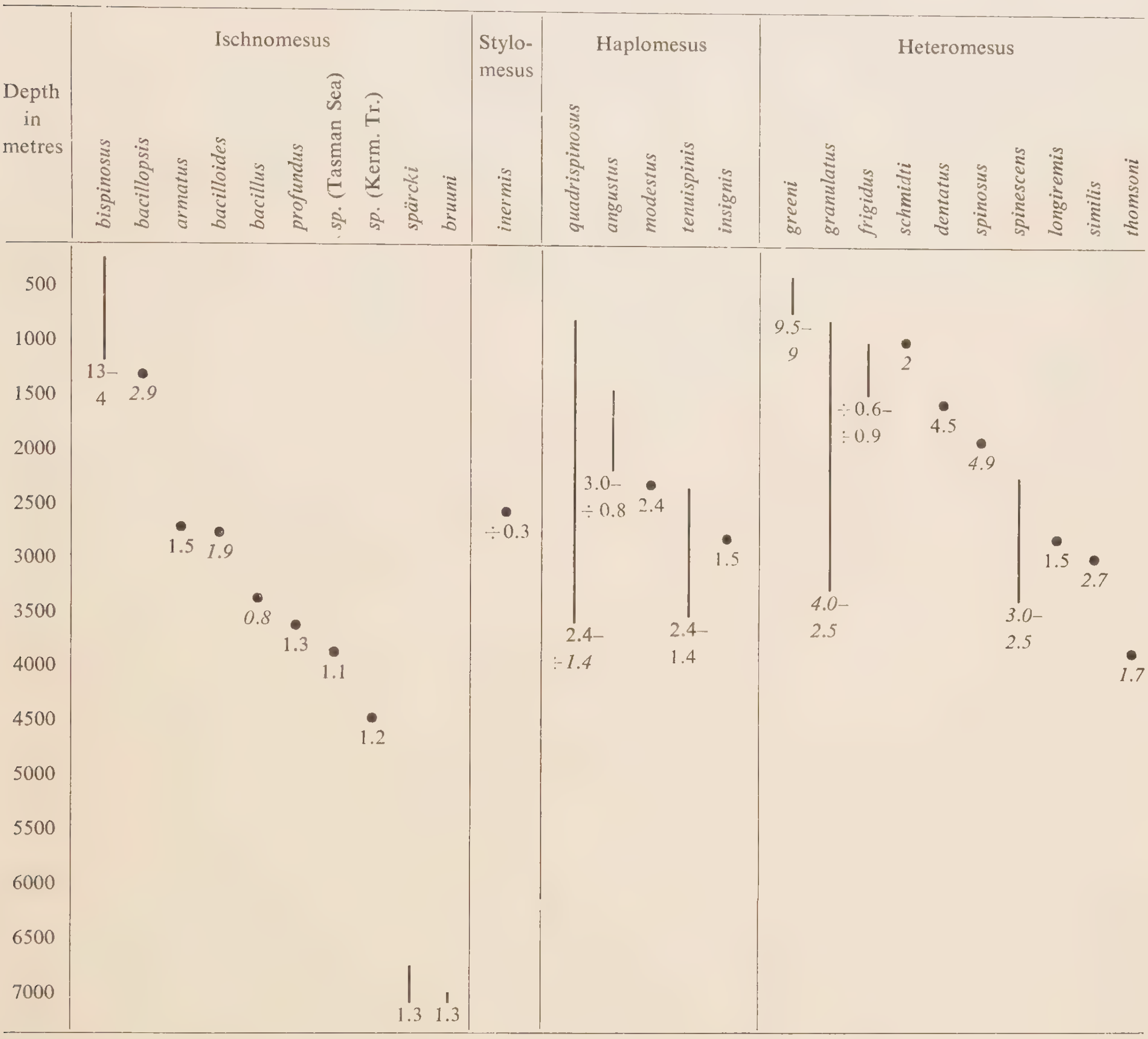
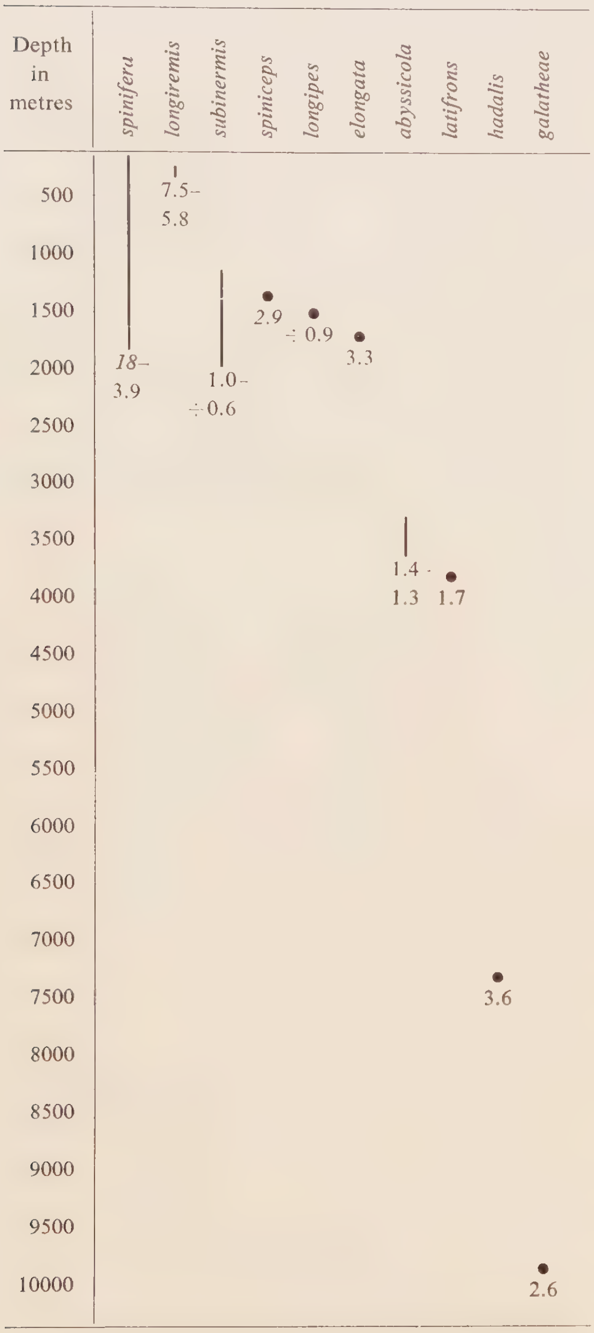


Table 7. Vertical distribution of *Macrostylis*. Available temperatures are given in °C. (the not fully reliable ones are in italics).



Macrostylis.

This genus which includes the deepest record of isopods has a vertical distribution as shown in table 7.

Also in this case a few species are known from shelf areas, while the majority range between depths of 1000 and 3500 m and temperatures below 4°C.

Ilyarachna.

This genus is not very well defined and possibly includes species which are not very closely related. Table 8 shows that *Ilyarachna* has considerably more shallow water representatives than the two preceding genera, more than half the species occuring at depths of less than 500 m. However, none of these are known from temperatures above 10°, and only three occur in water of more than 4°C.

Storthyngura.

In table 9 is given the vertical distribution of the well defined genus *Storthyngura*. It is seen that no species have so far been taken at depths of less than 400 m and only the antarctic *S. robustissima* is found above 1250 m depth. This is the most pronounced

Table 9. Vertical distribution of *Storthyngura*. Available temperatures are given in °C. (the not fully reliable ones are in italics).

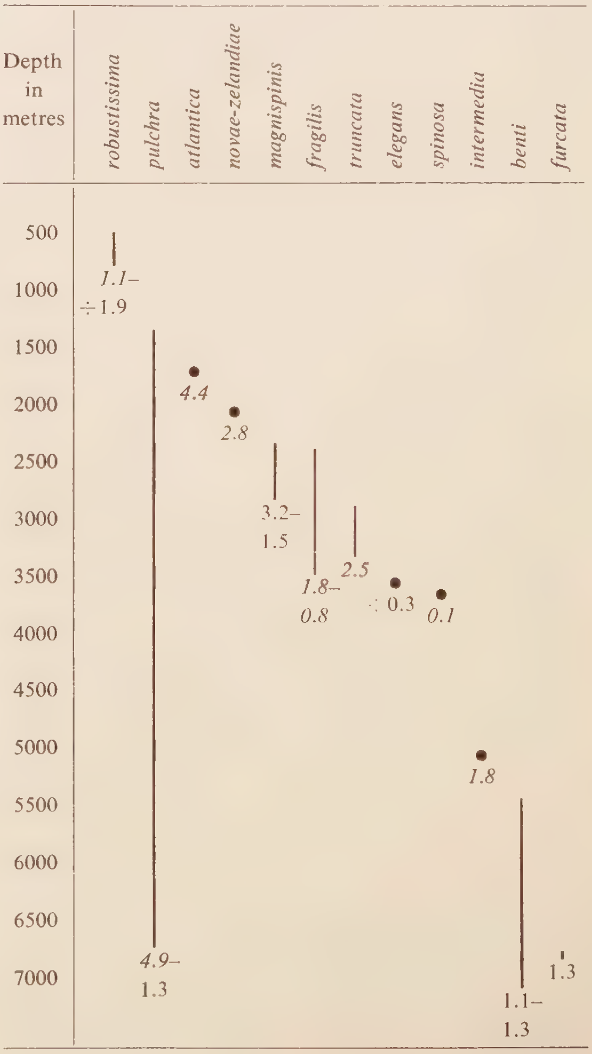
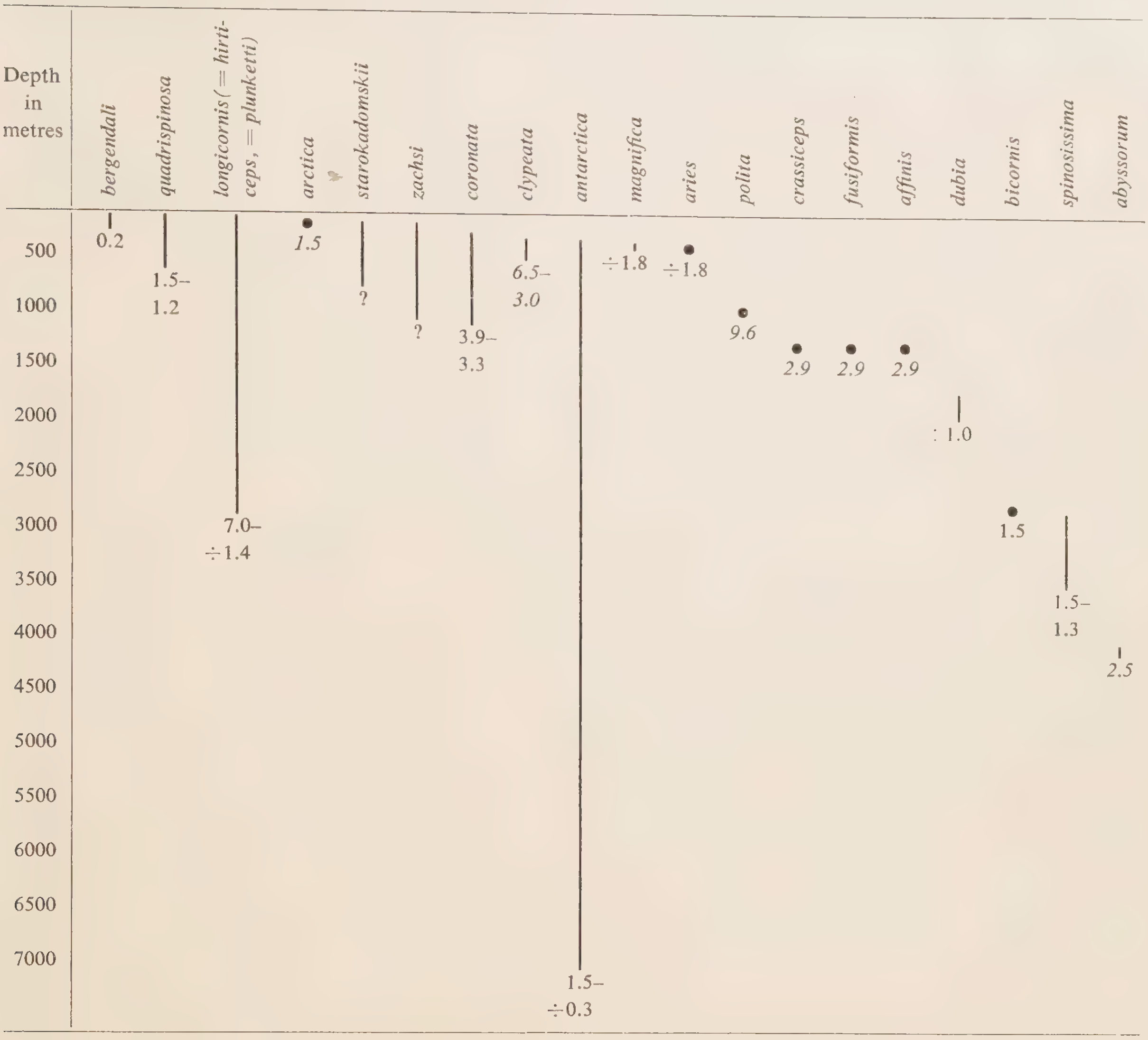


Table 8. Vertical distribution of *Ilyarachna*. Available temperatures are given in °C. (the not fully reliable ones are in italics).



deep-sea genus in question and at the same time within the Isopoda on the whole. Hitherto *Nannoniscus* was regarded as the most characteristic, polytypic deep-sea genus of this group. Even if four of the altogether sixteen species of *Nannoniscus* are known only from depths greater than 2000 m, five species occur at depths of less than 400 m, one of them even in shallow water in the Caspian Sea. No species of *Storthyngura* has been taken at temperatures higher than about 5°.

Eurycope.

As mentioned above, this genus is very rich in species and rather heterogeneous. As shown in table 10 it includes several species which are confined to the upper 500 m only or have at any rate these depths as part of their vertical distribution, even if the percentage of such species is not so high as in *Ilyarachna*. On the other hand, some of the species are definitely abyssal. Regarding the thermal conditions, altogether seven species have been taken at temperatures up to 9-10°. Six species do not occur in water of more than 7-7.5°; this upper limit is probably very reliable, being a result of HULT's careful investigations on the isopods of the Skagerrak (1942). Apart from a few species which occur at temperatures up to 4-5°, all the remaining 15 species (44 %) have never been taken in water of more than 2-3°, and 21 % never in water above 0°.

Table 10. Vertical distribution of *Eurycope*. Available temperatures are given in °C. (not fully reliable ones are in italics).

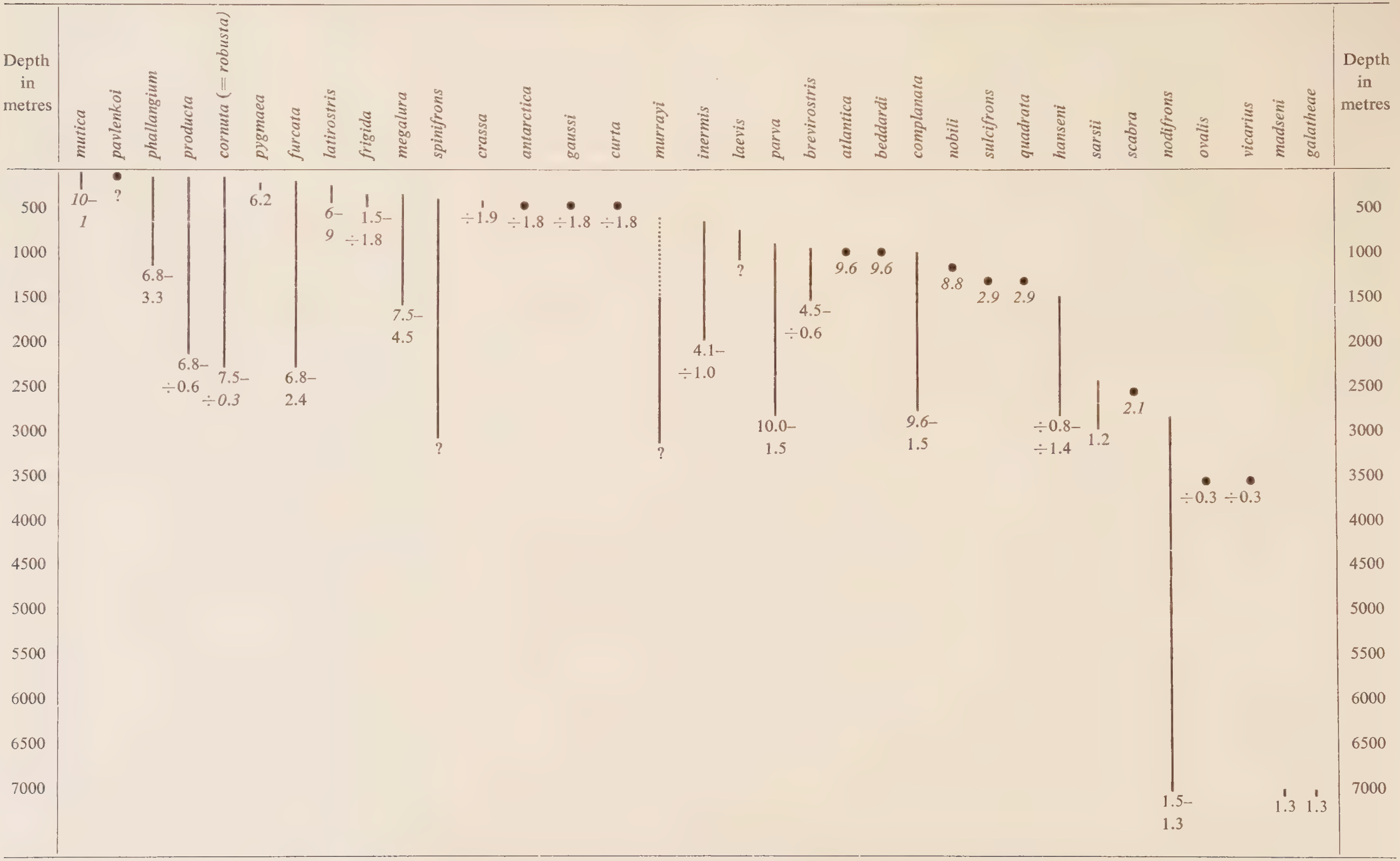
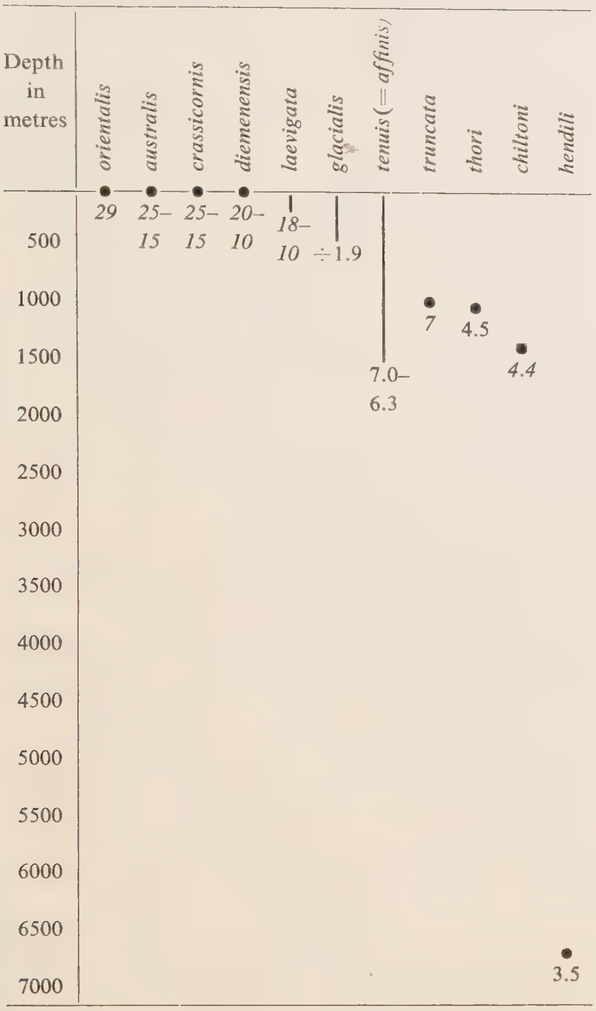


Table 11. Vertical distribution of *Leptanthura*. Available temperatures are given in °C. (not fully reliable ones are in italics).



Leptanthura.

Table 11 clearly shows that this genus is not comparable to the five preceding genera of Asellota. Four species are littoral and three of them moreover tropical or subtropical, i. e. living in water which even in winter is above about 15°. As stated by Barnard (1925), the genus is well defined, and at any rate one of the littoral species, *L. orientalis* (from Singapore), definitely belongs to this genus, while it is more questionary whether *diemenensis* and especially *australis* and *crassicornis* (from Port Jackson at Sydney) belong to *Leptanthura*. Only about half of the species occur at temperatures below 7° which is the lower limit for almost all species in the five other genera with hadal representatives. The temperature range within the genus is also much greater than in any of the preceding genera, covering from about + 29° to ÷ 2°.

If we consider the five genera of Asellota we find that in all of them except *Storthyngura* there are one or a few species which occur in shallow water of less than about 200 m depth. Most of these species have a comparatively great vertical distribution, going down to 1500-2000 m or even more. There are only a few exceptions. *Eurycope mutica* and *E. pygmaea (E. pavlenkoi* is very imperfectly known), *Macrostylis longiremis* and *Ilyarachna bergendali* and, to some extent, *I. quadrispinosa.*

Two of the shallow water species were taken at temperatures above 10°, but since they are boreal the winter temperatures at which they live are much less. The same is probably the case with several of the maximum temperatures of 7-8°, recorded for almost all the other shallow water representatives. It is very likely that these species reproduce in winter, when the temperatures are lower by 5-15° than during the summer.

The total number of species of the five genera of Asellota is 85. 78 % of these have so far only been known from depths greater than about 250 m, i. e. outside the shelf area. 54 % live exclusively outside the 1000 m curve and 36 % outside the 2000 m curve, i. e. are restricted to the abyssal and hadal regions. 21 % have only been taken at depths exceeding 3000 m, while 13 % are known only from depths greater than 4000 m. – When considering the lower limit of the 85 species we find that only 6 % are exclusively confined to the shelf area. 51 % do not go deeper than 2000 m, 69 % not deeper than 3000 m, and 87 % not deeper than 5000 m, while the remaining 13 % penetrate into the hadal zone of the trenches.

If we look at the temperature preference of the species of the five genera of Asellota we find that about two thirds of the species (66 %) have always been taken at temperatures below 3°, about half of them (51 %) below 2°, and 15 % have been taken only at negative temperatures. In fig. 54 are given the maximum and minimum temperatures recorded for the species of the five genera of Asellota as well as the temperatures of the species of *Leptanthura,* which – as mentioned above – do not follow the general pattern of the other genera.

It is rather difficult to say anything definite about the stenothermi of the present species of Asellota, because about half of them are known from one locality only. However, of the 39 species which have been recorded from more than one locality only 11 have a range of temperature of more than 4°. A few species have been collected at several localities, but always at nearly the same temperatures. This applies

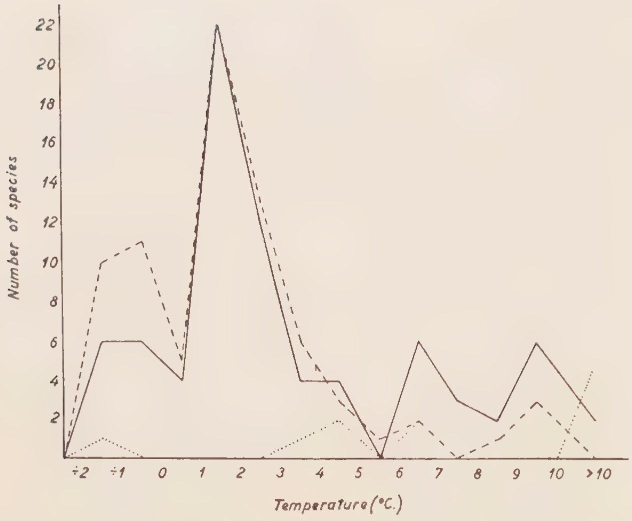


Fig. 54. Maximum (——) and minimum (- - - -) temperatures of the species of the five hadal genera of Asellota, and temperatures (· · · ·) of the species of *Leptanthura*.

to especially *Storthyngura pulchra* which is known from six different localities at depths between 1250 and 6600 m; the range of temperature is nevertheless only from 1.3° to about 4.9°C.

Vertical distribution of the hadal species.

When considering the vertical distribution of deep-sea animals it must always be kept in mind that our knowledge of this fauna rapidly decreases with increasing depth. The last word about the vertical distribution of most of (if not all) the present Isopoda has not yet been said, and the records of bathymetrical range are all minimum values. No less than 46% of all the species of the six genera with hadal representatives have been recorded only once so that nothing definite can be said of their vertical range.[1]

It goes without saying that the upper limit of the vertical range of the remaining species is considerably more exact than the lower, due to the extreme paucity of trawlings made at depths exceeding 3000-4000 m. It is my hope that the future study of the Galathea collections of isopods from these depths will prove profitable.

However, already our present knowledge shows a surprisingly great vertical range of some species covering several thousand metres. Till now the greatest range was found within *Eurycope spinifrons* (the records of which (GURJANOVA 1936) are, however, rather approximate) and *Ilyarachna hirticeps* which both have a bathymetrical distribution of about 2700 m. The three species which penetrate into the hadal region and are treated in the present report have a still greater range. *Eurycope nodifrons* was taken at 2700 m in the North Atlantic and at 7000 m in the Kermadec Trench which gives a range of 4300 m. *Storthyngura pulchra* is known from several localitites with depths between 1250 and 6600 m (a range of 5400 m). The greatest vertical distribution is that of *Ilyarachna antarctica* which has been taken at depths between 250 and 7000 m, thus covering not less than 6750 m, a vertical range which equals that of some of the hadal Holothurians and Polychaetes, treated by B. HANSEN and KIRKEGAARD (1956). Firstly, however, it is a question whether these species are able to breed at all these, highly different depths; it is possible that they actively ascend or descend to other depths outside the breeding period (as many littoral and bathyal species are known to do) or passively are carried to greater depths where they are not able to reproduce. Secondly, it is of course subjective whether two specimens from various localities belong to the same species or not. Moreover, we do not know whether for instance physiological differences of specific value exist among specimens showing no or only very slight morphological variations. According to our present knowledge we are at any rate forced to unite such specimens from widespread localities and probably rather different environments, as I have done in the three above cases. Under all circumstances it can, however, be stated as a general rule that the present Isopoda have a much smaller vertical range than that recorded for the Pycnogonida (FAGE 1954), for the Holothurians (l. c.), and especially for the Polychaetes (l. c.).

One of the probably true hadal species has a rather extensive vertical distribution within a restricted area, namely *Storthyngura benti,* which has a range of 1650 m in the Kermadec Trench (from 5350-7000 m).

The vertical distribution of the remaining five hadal species in this trench is restricted to at most 400 m. The distribution of isopods at the various stations beyond 4000 m in the Kermadec Trench is rather puzzling. As will be seen in table 12 no iso-

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[1] About the same percentage of Echinoderms is also known from a single locality only. JENSENIUS MADSEN (1954, p. 34) draws attention to the fact that even if very few new deep-sea genera and to some extent -species have been added to the fauna since the days of the Challenger Expedition, the majority of the species of Echinoderms has been caught only once and again in the deep-sea, while some species occur extremely often in the trawls. This probably means that some species are much more common (or perhaps more easily caught) than others.

Table 12. Number of Isopoda and Amphipoda in the Kermadec and Kurile-Kamtchatka Trenches, compared with the total number of bottom-living animals.

	Station	663	664	661	654	653	650	658	651	649	–	–	–
Kermadec	Depth in metres	4400	4550	5350	5850	6150	6600	6700	7000	8250	–	–	–
	Species of Isopoda	4 }6	3 }3	2 }2	3 }9	0 }1	2 }3	4 }7	7 }12	0 }2	–	–	–
	Species of Amphipoda	2	0	0	6	1	1	3	5	2	–	–	–
	Total of all spp.	51	58	27	33	9	21	34	29	21	–	–	–
	% Isopoda	8	5	7	9	0	10	12	24	0	–	–	–
	% Isopoda + Amphipoda	12	5	7	27	11	14	21	41	10	–	–	–
Kurile–Kamtchatka	Depth in metres	–	5100	5150	–	–	–	6850	7200	8400	8650	9000	9800
	Spp. of Isop. + Amphip.	–	1	0	–	–	–	1	8	6	1	0	0
	Total of all spp.	–	53	26	–	–	–	43	40	20	8	17	6
	% Isopoda + Amphipoda	–	2	0	–	–	–	2	20	30	13	0	0

pods were caught at the deepest station at 8200 m which yielded 21 other species of bottom-living animals. The number of isopods at the three stations between 4400 and 5400 m is also remarkably low when compared with the percentage of isopods at the deeper stations. The table also shows that the number of Amphipods has the same relative maximum at stations between 6000 and 7000 m.

Of course this peculiarity may be accidental, the material being very small indeed. On the other hand, it is interesting to note that the Russians apparently found something similar when trawling at increasing depths in the Kurile-Kamtchatka Trench. ZENKEVITCH *et al.* in table 1 (1954, p. 70) have given the number of species of the various trawling depths in that trench.[1] As will appear from table 12 the Russians also found a pronounced predominance of Isopoda-Amphipoda at great depths, but none of these animals at the greatest depths. The only major difference seems to be that in the Kurile-Kamtchatka Trench the predominance of Isopoda-Amphipoda is found somewhat deeper, i. e. between 7000 and 8500 m instead of between 6000 and 7000 m in the Kermadec Trench.

Also the extensive trawlings by the Galathea outside the Kermadec area at depths between 4000 and some 5800 m yielded a remarkably small number of species of isopods. Altogether 30 successful trawlings and 7 successful quantitative bottom samplings were carried through at these depths, but no more than eleven species of isopods (in one or a few specimens) was the result. This gives on an average 1 species of isopods per 2.5 dredgings. In the real trenches (deeper than 6000 m) thirteen species of isopods were caught once, twice or three times in the altogether 16 successful trawlings and 4 successful bottom samplings. This gives 1 isopod species per less than 1 dredging, i. e. almost three times more isopods per dredging than at the more moderate depths between 4000 and 5500 m.

It should also be mentioned that only three species of isopods were till now known to occur deeper than 4000 m (apart from the only hadal species *Bathyopsurus nybelini)*. Even if the smaller number of trawlings beyond 4000 m is considered these three species form a striking contrast to the altogether 45 isopod species which have been collected between 3000 and 4000 m.

It thus seems as if the abyssal isopod fauna is quickly thinning when we move downwards beyond some 4000 m, but in the trenches – at depths greater than some 6000-7000 m – there is apparently a conspicuous increase of species. Together with the vertical limitation and the regional endemism of most of the hadal isopods (and amphipods) this fact indicates a special trench fauna of these animals.

Regional distribution of the genera found in the hadal zone.

Ischnomesus.

This genus has two species in the northern Atlantic, one is boreoatlantic-mediterranean, and the other seven species are from the southern hemisphere: one from Cape, three from the Kermadec Trench, one from the Tasman Sea, and two species from subantarctic areas. When the group Ischnomesini is

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[1] Since the Russians have given the number of Isopoda and Amphipoda only in total, I have for comparison included in table 12 the number of species of Amphipoda at the various trawling depths in the Kermadec Trench as well.

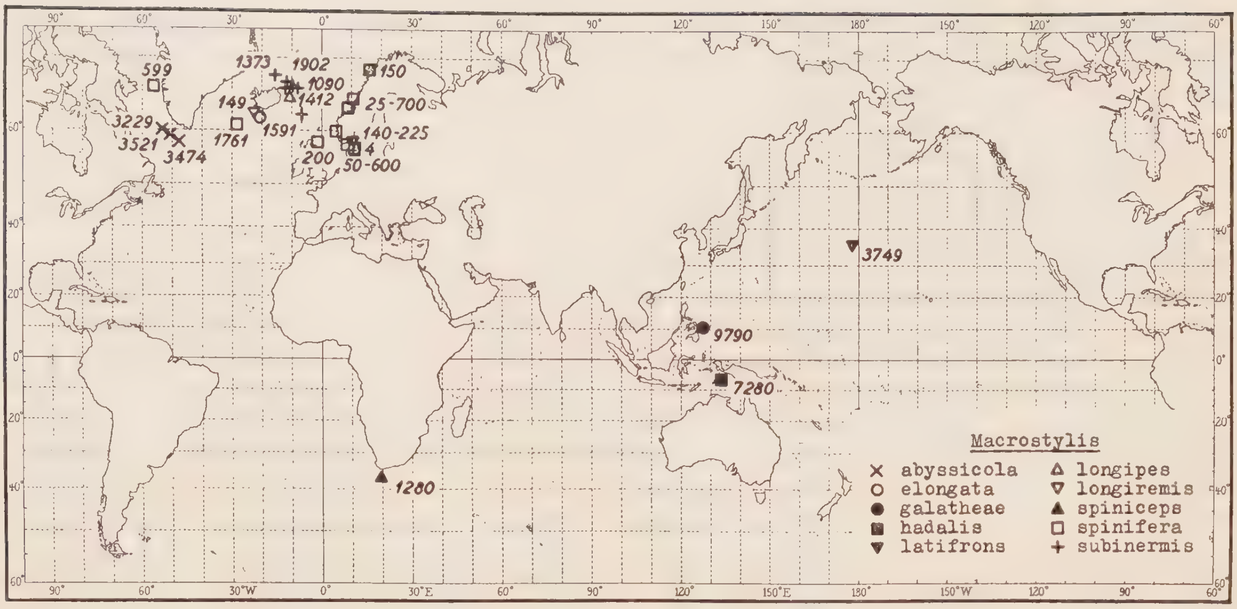

Fig. 55. Distribution of the deep-sea genus *Macrostylis*. Depths in metres.

considered as a whole the predominance of North Atlantic species is clear: almost two thirds occur in this area, while the remaining ten species are distributed as follows: one species in the central Pacific, two at Cape, three in the Kermadec Trench, one in the Tasman Sea, two in the subantarctic and, finally, one species in the antartic region.

Macrostylis.

The genus which includes the deepest known Isopoda has a somewhat scattered geographical distribution (fig. 55). The apparent predominance of species in the North Atlantic (six out of a total of ten species) is certainly due to the fact that the Ingolf Expedition succeeded in securing many extremely small species of isopods, six of which are the present species of *Macrostylis*. A closer investigation of especially the North Pacific will probably reveal several species there. On the other hand, it is not very likely that the genus is represented by very many, if any, species in the antarctic and subantarctic regions. These waters have, next to the North Atlantic, been comparatively well studied, and especially the German Antarctic Expedition collected many small forms (for instance of *Eurycope)*, but never a single species of *Macrostylis*.

Ilyarachna.

Also this genus has a wide distribution. Ten of the nineteen species are North Atlantic (three of them penetrating into the North Polar Sea), and two more species are from the northern hemisphere, namely one from the Sea of Japan only and another from this sea and the Sea of Okhotsk as well. Of the remaining seven species three are from the Cape, three from the antarctic region and one species from this region as well as from the Kermadec Trench.

Storthyngura.

As mentioned above, this is the most pronounced abysso-hadal genus within the Isopoda. Fig. 56 gives the horizontal distribution. The even distribution in all oceans and in all latitudes is evident. It is very characteristic that in this genus there is no predominance in the North Atlantic (and the Antarctic) such as in *Macrostylis, Ilyarachna,* and *Eurycope*. This may be explained by the fact that the size of the species of *Storthyngura* is considerably larger than of those of the other three genera. In my opinion this genus, therefore, gives a more correct picture of the actual distribution, of course with the distinct reservation that still very much work is left to be done in the deep-sea.

Eurycope.

Half of the 34 species occur in the North Atlantic and are so far known only from that area. Three of them penetrate into the North Polar Sea, while the great majority are from the N. E. Atlantic. Strange enough, only two species are known from the N. W.

Atlantic south of Cape Cod and none from the central North Atlantic. In the North Pacific there are two species known from the Sea of Japan and one ranges from the Bering Sea to off Southern Japan. In equatorial areas one species was taken in the Gulf of Panama. From south of the equator twelve species have been described, namely two from the Kermadec Trench, two from Cape, and eight from antarctic regions. Finally, one species only has a very wide distribution, being known from Davis Strait in the North Atlantic and from the Kermadec Trench in the S. W. Pacific.

The knowledge of no less than eighteen of the very small species of *Eurycope* was the result of the careful collecting activity of G. O. Sars and of the Ingolf and the German Antarctic Expeditions, and there is no doubt that several are still to be found, especially in the North Pacific.

Leptanthura.

This genus has a distribution different from that of all the preceding genera. While they predominated in the North Atlantic and to some extent in the Antarctic, *Leptanthura* has only two species out of eleven in all in the former area and one in the latter. Three species are found in the tropics and – as mentioned above – only two of them show submergence. Four species occur between latitudes 30 and 40° South (one at Cape, two at Sydney and one off New Zealand) and one species is known from Tasmania. Thus, *Leptanthura* has a distribution similar to the Anthuridea on the whole, with much fewer representatives in the temperate and subarctic-subantarctic areas than the Asellota.

As a general rule it can be stated that all the six genera with hadal representatives are cosmopolitan, but that very few of their species are so far found in more than one ocean or even part of an ocean. As a matter of fact, this only applies to four species or 5% of the total number. Of course, further information about the distribution of the present species as well as increased knowledge of their taxonomy, which may mean increased numbers of synonyms, will without doubt raise this percentage. However, there is hardly any doubt that the general picture of cosmopolitan genera and non-cosmopolitan species is correct. This agrees well with the abyssal Pycnogonida of which 9 genera are cosmopolitan, while all the 43 species (except 3) are restricted to one ocean, or part of it (Fage 1954 & 1956). Within the Crustacea Decopoda it is also in accordance with the bathyal and abyssal Galatheidae of which only

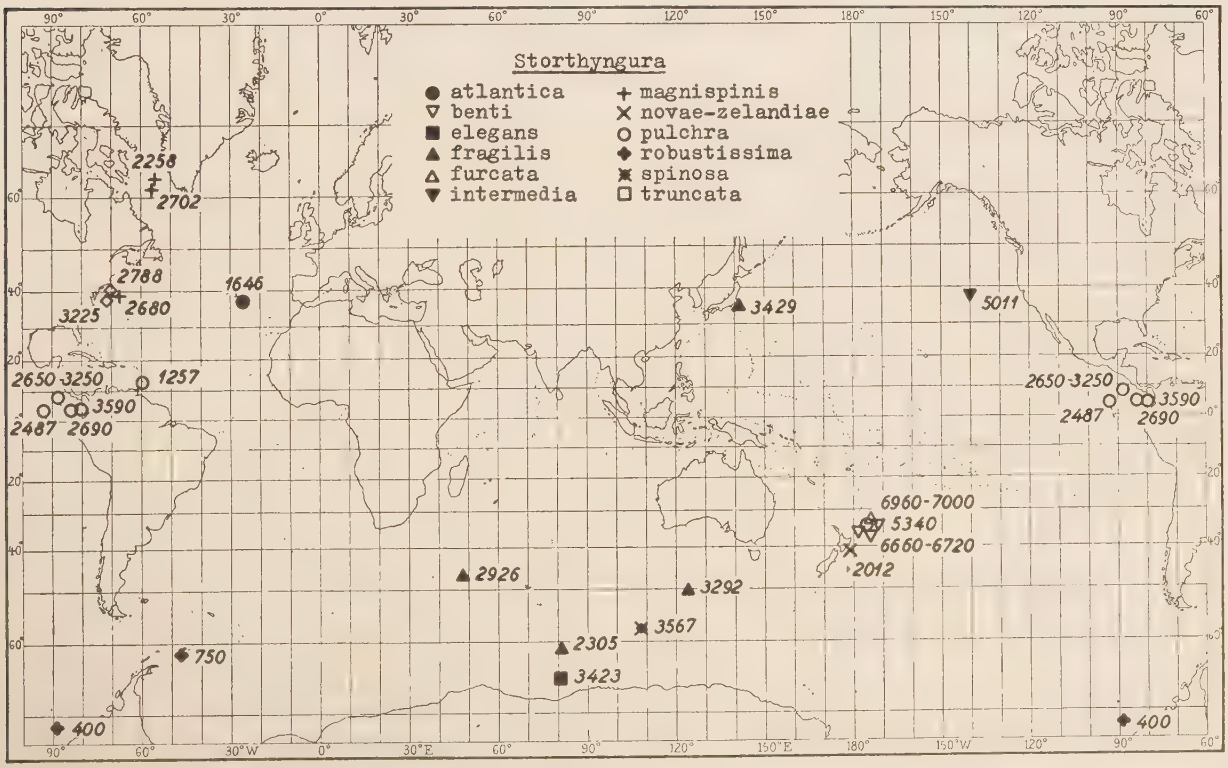
Storthyngura
● atlantica
▽ benti
■ elegans
▲ fragilis
△ furcata
▼ intermedia
+ magnispinis
× novae-zelandiae
○ pulchra
◆ robustissima
✱ spinosa
□ truncata
2258
2702
2788
3225
2680
1646
1257
2650-3250
3590
2487
2690
3429
5011
6960-7000
5340
6660-6720
2012
2926
3292
3567
2305
3423
750
400
90°
60°
30°
0°
120°
150°
180°
30°W
30°E
150°E
150°W
20
40
60

Fig. 56. Distribution of the deep-sea genus *Storthyngura*. Depth in metres.

3 out of 146 species are cosmopolitan (Balss 1913, p. 181); on the other hand, Balss (1925, p. 309) has enumerated a considerable number of cosmopolitan species of other abyssal decapods, mainly among the deepest known species. Also in the Echinoderms, which is one of the most characteristic elements of the deep-sea, the abyssal genera are typically cosmopolitan (Madsen 1954). The percentage of cosmopolitan species of abyssal Asteroids, Ophiuroids, and Holothurioids is about 7% and of species occurring in more than one ocean about 13%.

Besides the cosmopolitan nature of the present deep-sea genera of Isopoda they have also (except *Leptanthura)* surprisingly many representatives in the arctic and antarctic regions; this is also the case with the deep-sea genera of Pycnogonida as pointed out by Fage (1954).

Regional distribution of the hadal species.

The distribution of the hadal isopods in the various trenches is remarkable. In table 13 is shown the number of successful trawlings and bottom samplings ("hauls") at depths exceeding 6000 m, and the number of species of Isopoda compared with that of other invertebrates so far published or worked up (including Amphipoda,[1] Echinodermata, Polychaeta and "other invertebrates": Actinaria, Octocorallia, Pycnogonida, and Mollusca).

Without considering the very difficult and therefore less successful haul by the Swedish Deep-Sea Expedition in the Porto Rico Trench the table clearly shows that the representation of Isopoda in the various trenches does not follow that of most of the other hadal animal groups known at present. Only the Amphipoda have a similar predominance in the Kermadec Trench compared with the number in the other trenches. As far as the Isopoda are concerned this may perhaps be due to the fact that most of the deep-sea species from which the hadal species may have originated occur in high latitudes so that the rather close Kermadec Trench was most easily populated by an Isopodan fauna.

Table 13. Number of species of Isopoda and other invertebrates in relation to number of successful "hauls" (trawlings and bottom samplings) in the hadal zone of the various trenches investigated.

Trench	No. of successful "hauls"	Number of species						
		Isopoda	Amphipoda	Total	Echinodermata	Polychaeta	Other invertebrates	Total
Porto Rico	1	1	3	5	1	1(2)	0	2(3)
Philippine	4	1	2	3	2	1	2	5
Sunda	3	0	0	0	3	4	4	11
Banda	5	2	2[1]	4	6	10	5	21
New Britain	3	0	0	0	3	0	0	3
Total of Phil.-New Br.	**15**	**3**	**4**	**7**	**14**	**15**	**11**	**40**
Kermadec	**5**	**9**	**10**	**19**	**9**	**12**	**14**	**35**

Conclusive remarks on the distribution.

Both the vertical and the regional distribution of the six genera with hadal representatives (and especially the five genera of Asellota) show many resemblances.

Firstly, all the genera are cosmopolitan, while almost all the species have so far only been found within a restricted area.

Secondly, all the genera of Asellota show submergence of those species which have been recorded from the equatorial areas, none of these species having been caught at depths above 700-1000 m and the majority living at 2000 m or deeper.

Thirdly, considerably fewer species are eurybathic than in other groups with hadal species, such as Polychaeta, Pycnogonids and Holothurians.

Two of the three species which have penetrated into the trenches are probably cosmopolitan, having been taken in the E. and S. W. Pacific and W. Atlantic *(Storthyngura pulchra)* and in the S. W. Pacific and N. W. Atlantic *(Eurycope nodifrons)*, while the third *(Ilyarachna antarctica)* is known from the Antarctic and the S. W. Pacific.

All the ten really hadal species have been taken only in the trenches, and six of them at two or more stations (in the same trench). This seems to indicate that the trench fauna has a certain element which is peculiar to it.

Four other major groups with representatives in the trenches have been or are being worked up. These are: Actinaria (Carlgren 1956), Amphipoda (Schellenberg 1955 and information kindly supplied by Dr. E. Dahl), Echinodermata (Madsen 1953 & 1956 and B. Hansen 1956), and Polychaeta which count about 32 trench species, of which, however, only 22 are identifiable (Eliason 1951, Uschakov 1955, and Kirkegaard 1956). Table 14 shows that the number of species restricted to the trenches is

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[1] According to information given by Dr. E. Dahl.

Table 14, Species peculiar to the trenches in proportion to the total number of species, so far recorded from the trenches (from depths greater than about 6000 m).

Group	Total no. of trench species	Species known only from the trenches	
		Number	%
Actinaria	6	6	100
Isopoda	13	10	77
Amphipoda	16	9	56
Echinodermata	18	7	39
Polychaeta	22	8	36
Total	75	40	53

extremely varying within these four groups and the Isopoda.

The small number of species dealt with in this paper and their restricted distribution do not justify any speculations regarding the general, regional distribution of abyssal and hadal species.

3. Relationship and possible origin of the hadal species

Before trying to answer the interesting question of the origin of the hadal isopod species it is worth while considering to which other species the present hadal species are most closely related.

Only two of the hadal species which belong to the same genus *(Macrostylis galatheae* and *M. hadalis)* are near relatives. The other species of the same genera seem to be more nearly related to one of the bathyal or abyssal species than to the other hadal species of the genus. *Leptanthura hendili* does not show special affinity to any of the other species of *Leptanthura*.

In table 15 is given the nearest relatives of the hadal and abysso-hadal species as well as their distribution.

It will be seen from the table and from the above (p. 147f) given distribution of all the other species of the present genera that in nine of these eleven species the nearest relative is at the same time one of

Table 15. Regional and vertical distribution of seven hadal and three abysso-hadal species and their nearest relatives.

Hadal or abysso-hadal species	Nearest relative(s)	Hadal (abysso-hadal) species		Nearest relative(s)	
		Distribution	Depth (m)	Distribution	Depth (m)
Ischn. bruuni	*I. bacilloides*	Kermadec Trench	7000	S. E. Pacific	2650
Ischn. spärcki	*Ischn.* sp.[1] *Ischn.* sp.[1]	Kermadec Trench	7000	Kermadec Trench Tasman Sea	4400 3700
M. galatheae	*M. hadalis* *M. latifrons*	Philippine Trench	9800	Banda Trench Central N. Pacific	7300 3750
M. hadalis	*M. galatheae* *M. latifrons*	Banda Trench	7300	Philippine Trench Central N. Pacific	9800 3750
Il. antarctica	*Il. bicornis*	Antarctic Atl. & Ant. Ind. Oc. & Kermadec Trench	250-7000	N. W. Atlantic	2700
S. benti	*S. robustissima*	Kermadec Trench	5340-7000	Antarct. Atl. & Ant. E. Pac.	400-750
S. pulchra	*S. fragilis*	Trop. W. Atl., Trop. E. Pac. & Kermadec Trench	1250-6600	Ctr. N. Pac. & Ant. Ind. Oc.	2300-3450
S. furcata	*S. elegans*	Kermadec Trench	6700	Antarctic Indian Ocean	3400
E. nodifrons	*E. crassa*	N. W. Atl. & Kerm. Tr.	2700-7000	Antarctic Indian Ocean	350-400
E. madseni	*E. ovalis* *(E. furcata)*	Kermadec Trench	7000	Antarctic Indian Ocean (N. Atlantic)	3400 (150-2250)
E. galatheae	*E. vicarius*	Kermadec Trench	7000	Antarctic Indian Ocean	3400

[1] The two yet undescribed species, mentioned on p. 97.

the species which is nearest to them geographically. This is especially clear in the genus *Macrostylis* in which the two hadal species (from the Philippine and the Banda Trenches) are very similar; they are furthermore very near to the third Pacific species, *M. latifrons* (see map on p. 148) which is at the same time the deepest recorded, non-hadal species. There is hardly any doubt that these three species have the same ancestor (which was probably near to *latifrons)* and that *galatheae* and *hadalis* after having descended into the two trenches have changed to such a degree that they must now be regarded as different, but nearly related species. The place of origin of *Macrostylis* may have been arctic or subarctic (boreal) regions, where the majority of the species are found to-day. Only two species have been recorded from the southern hemisphere and none of these from south of lat. 35°.

Also the two nearest relatives of *Ischnomesus spärcki* are found very near to it geographically. One of these is the yet undescribed species from the same trench, and the other (likewise undescribed) species was caught in the Tasman Sea which is not separated from the Kermadec Trench by any ridges. The finding places of *I. bruuni* and *bacilloides* are also connected by vast areas with great depths.

The genus *Storthyngura* has also a restricted distribution of the related species (except *benti)*. The genus seems to be rather young, having been branched off from *Eurycope* fairly recently, and it is notably more specialized than *Eurycope*. Somehow we here find the same circumstances as within the Galatheidae, of which the original and most primitive genera *(Galathea* and *Munida)* are littoral and bathyal, while the true deep-sea genera *Uroptychus* and *Munidopsis* are more highly specialized (Balss 1913, p. 181). The evolution of the genus *Storthyngura* certainly took place in the Antarctic where all the abyssal species except three still live. The Kermadec Trench is within fairly easy reach of the antarctic species, of which two (related to or perhaps identical with *S. elegans* and *robustissima)* spread northwards and descended into the trench. Here they gave rise to the two hadal species *furcata* and *benti*. *S. pulchra* (or its ancestor) spread northwards into abyssal parts of the Atlantic and the Pacific (and the Indian Ocean?), and this species also invaded the Kermadec Trench. Possibly this invasion happened fairly recently, since the Kermadec population is almost identical with the populations of the Atlantic and Pacific deep-sea near the equator.

The two hadal species of *Eurycope, madseni* and *galatheae,* have probably also their origin in the Antarctic, even if the majority of the other species of *Eurycope* are from the northern hemisphere. The origin of *nodifrons* is very dubious; it has been caught in two localities almost as far from each other as possible (Davis Strait and Kermadec). It seems to be most nearly related with the antarctic species *crassa,* but is also closely allied to species in the North Atlantic from where it possibly originated. Almost as peculiar is the relationship of *Ilyarachna antarctica* which is certainly most closely related to a likewise North Atlantic species, *bicornis*.

Thus, there is hardly any doubt that the present, still very small number of hadal isopods has derived from cold areas in the arctic and especially in the antarctic regions. This place of origin agrees with the suggestions put forward by Dahl (1954). The slight variation in hadal species from one locality to another in the same trench may indicate a fairly recent invasion. On the other hand, the undoubtedly stable character of the environments in the trenches may have served to prevent or retard genetically induced variations, more likely to occur in more changing environments.

4. Special peculiarities of the hadal Isopoda

Even if the material of Isopoda from the greatest depths is still very small, it seems possible to establish some general rules as to the nature of the hadal species.

Size.

It has long been known that the deep-sea fauna comprises many species which are larger than their shallow water – or perhaps rather warm water – representatives. This is also the case with the isopods. By far the largest isopod is *Bathynomus giganteus* (A. M.-Edw.) which reaches a length of 270 mm and a width of 120 mm and lives at depths of between 1350 and 1700 m. The two biggest members of the family Serolidae are *Serolis bromleyana* Suhm (54 mm long, 56 mm wide) and *S. neaera* Bedd., the only two Serolids which go beyond the 3000 m curve.

Within the Asellota the 33 mm long *Munnopsurus giganteus* (G. O. Sars) is still the largest; it occurs in the Arctic, from 40-1470 m and at temperatures between + 1.1 and ÷ 1.1°C. Of special interest is the fact that the 60 specimens of *Eurycope inermis* Hansen (1916, p. 143) which were caught in the cold area of the N. W. Atlantic, covered by the Ingolf Expedition, were from 9-11.5 mm long, while the 40 specimens from the warm area were only from 5.5-7 mm long. The former all occurred at temperatures between ÷ 0.5 and ÷ 1.0°C, and at depths between 550 and 1900 m, while the temperatures of the latter ranged from + 1.2 to + 4.1°C, and the depths from 680 to 1520 m. In this case it seems as if the temperature (and amount of food) is the deciding factor. Also *Storthyngura fragilis* (Bedd.) is interesting in this respect. As shown in table 16 the species was caught by the Challenger at four stations, one off Japan and the other three in the Antarctic Indian Ocean. The table shows that not only does the size increase with decreasing temperature, but it is apparently quite independent of the pressure factor, the smallest individuals (of which only one reaches the length of 12 mm) having been caught at the greatest depths, and the largest specimen at the lowest depth. At the same time, there seems to be a tendency of increasing size passing southwards (see later).

When the present material of isopods from the hadal fauna is considered it is very striking that most species are larger than almost all hitherto known species within the same genera.[1] This fact is clearly to be seen from the following summary which gives the maximum length of all the species in genera with hadal species.

Ischnomesus. 3-5 mm: 3 species; 5-10 mm: 1 species; 13-15 mm: 2 spp.; the two hadal spp. *(bruuni* and *spärcki):* 13.5 and 16 mm.

Macrostylis. 2-3 mm: 5 spp.; 3-4 mm: 2 spp.; 4-5 mm: 1 sp.; *M. hadalis:* 4.6 mm; *M. galatheae:* 5.5 mm.

Table 16. Size and occurrence of *Storthyngura fragilis* (Bedd.)

Challenger Station	Lat.	Depth in m	Temp. °C	Max. length in mm
237	35°N	3430	1.8	12
147	46°S	2930	1.2	17
158	50°S	3290	0.8	17
152	61°S	2310	÷0.3	30

Ilyarachna. 2-5 mm: 9 spp.; 5-10 mm: 7 spp.; 10-13 mm: 2 spp.; 17 mm: 1 sp.; *I. antarctica* in the Antarctic: 5.3 and 6.3 mm, in the Kermadec Trench: 15.2 mm.

Storthyngura. 2-5 mm: 3 spp.; 5-10 mm: 2 spp.; 10-12 mm: 1 sp.; 3 spp. from the Antarctic: 20-28-30 mm; *S. benti:* 19 mm, *S. pulchra:* 27 mm; *S. furcata:* 30.5 mm.

Eurycope (2 spp. have no records of size and 1 is pelagic). 1-5 mm: 17 spp.; 5-10 mm: 7 spp.; 10-12 mm: 1 sp.; 1 sp. from the Antarctic: 24 mm; 1 sp. from the Gulf of Panama: 25.6 mm; *E. galatheae:* 5.8 mm; *E. madseni:* 6.9 mm; *E. nodifrons* in the Arctic Atlantic: 5.1 mm and in the Kermadec Trench: 13-13.5 mm.

Leptanthura. 5-10 mm: 3 spp.; 10-15 mm: 2 spp.; 15-20 mm: 3 spp. (one at 900 m off West Africa, one at Cape of Good Hope, and one in the Antarctic); 1 sp. is 26 mm long (Cape); *Leptanthura hendili* is only 11.3 mm and is thus (together with the two species of *Eurycope)* the only hadal species which are not among the largest representatives of their genus.

It is worth while mentioning in this place that in some of these genera the dominance of southern species among the largest members of the genus is very pronounced. In *Ischnomesus* the three smallest species are from the northern Atlantic, the three largest (besides the two hadal species) from off Cape of Good Hope and the Antarctic. *Ilyarachna* has its largest representative in the Antarctic (but also one very small and one moderately large species are from that region). The four largest species of *Storthyngura* are from antarctic waters, while the two smallest are North Atlantic.[1] The comparatively small size of the three hadal representatives of *Eurycope* indicates that this genus does not follow the general pattern, possibly because *Eurycope* may not constitute a natural genus. Neither the other species of that genus show any convincing correlation between size and locality. Altogether 25 species of *Eurycope* occur in high latitudes, either of the northern or of the southern hemisphere. Nine of these are from the southern, and although none of them are among the smallest species, only three of them are among the nine largest. In *Leptanthuru* the 4 smallest species are tropical or North Atlantic, and 3 of the 4 largest are antarctic.

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[1] In the preliminary paper on the Russian deep-sea investigations, ZENKEVITCH *et. al.* (1954, p. 65) mention that the Asellota from 7200-8400 m are "very large".

[1] As mentioned on p. 121 the only 2.3 mm long specimen of *S. elegans* Vanh. from the Antarctic is certainly juvenile.

Armament with spines.

The bathyal and abyssal isopod faunas, especially in the Antarctic, are characteristic in that many of the species and genera are, on the whole, more abundantly armed with spines and processes than are their relatives in shallow water. Most remarkable in this respect are *Mormomunna spinipes* Vanh. and *Echinomunna horrida* Vanh. from the antarctic deep-sea. However, when comparing such spiny forms to their nearest relatives among the hadal species, it seems as if the latter are preferably less spiny and the spines are shorter. Also within the same trench the specimens and species with the shortest spines are found deepest down, for instance *Storthyngura benti* and *Ischnomesus spärcki;* especially the latter is much less spiniferous than the nearly related, still undescribed species from 4400 m (cf. p. 97). The reason for this apparent reduction is difficult to explain. The spines may – together with the often very elongate legs – serve to prevent the animals from sinking into the soft ooze on the bottom. There is, however, hardly any reason to believe that the sediments of the trenches are more solid than those of the bathyal and abyssal slopes and plains. Moreover, the legs of the hadal species do not seem to have undergone a corresponding reduction in length.

Eyes.

As could be expected, none of the hadal species have eyes. Some of the shallow water species of one genus, *Leptanthura,* have small, reduced eyes, but all other species of the present genera with hadal species are blind, as are normally the Asellota.

In some of the species (for instance *Ilyarachna antarctica,* p. 107) a conspicuous eye rudiment was found; unfortunately, the present material does not allow a study of this interesting feature.

Calcification.

Some of the species are extremely brittle, viz. the species of *Ischnomesus* and *Macrostylis,* and they are definitely more fragile than their bathyal and abyssal relatives. The species of *Eurycope* have also a very weak integument, but in this genus it is due to the fact that it is almost not calcareous at all. Finally, the species of *Storthyngura* are very robust, being apparently not less calcified than the abyssal species of the same genus. It is interesting to note that JENSENIUS MADSEN has found a similar brittleness in some deep-sea Echinoids, while others "have skeletons of a consistency comparable to those of the shallow-water forms" (1954, p. 32).

Colour.

As well the brittle as the robust hadal isopods have, both when freshly caught and in alcohol, a pure white, sometimes even shining white colour, which is rather characteristic. The same, totally white colour of hadal isopods has been noted by ZENKEVITCH *et al.* in their preliminary report on the investigations of the Kurile-Kamtchatka Trench (1954, p. 65).

General appearance.

On the whole, however, the present hadal species are remarkably similar to their abyssal, bathyal and even sublittoral relatives. This is also emphasized by the fact that none of them belong to a genus of their own. They may be characterized as being preferably somewhat larger, less spiny, and more purely white representatives of the mainly bathyal and abyssal genera to which they belong.

5. Biology

Reproduction.

Unfortunately, none of the present hadal females were egg-bearing so that nothing can be said about the number and size of eggs in the marsupium, etc.

Food.

There is hardly any doubt that most of the hadal animals are filter-feeders or mud-swallowers, feeding on bacteria, plant débris, etc. Some are, however, definitely predators. This applies to the Polychaetes and most of the Crustaceans. Even a superficial investigation of the mouth-parts of the present hadal isopods shows that they are perfectly like those of shallow water forms, the Asellota having crushing and grinding mouth-parts, while in the Anthuridea they are suctorial.

On account of the fairly rich material of *Storthyngura pulchra* an investigation of the contents of the intestine of a specimen from St. 650 (Kermadec Trench, 6620 m) has been made. It revealed a rather great variety of remains but few of them could be identified. There were without doubt shells of Radiolaria and chaeta and a single jaw of Polychaetes. Moreover, there seemed to be spicules of Spongia and remains of Crustacea (for instance a few fragments of legs and integuments).

D. SUMMARY

1. The Galathea Expedition collected altogether twelve species of Isopoda from depths greater than 6000 m, namely one from the Philippine Trench, two from the Banda Trench and nine from the Kermadec Trench. Nine of them are described as new species, but all belong to already known genera. Besides, several species, especially from the German Antarctic Expedition, are redescribed for comparison – see list of contents.

2. Eleven of the species belong to Asellota and one to Anthuridea. Of the altogether 62 species of isopods which are now known from depths greater than 3000 m the Asellota include 86 %, the Anthuridea only 5 %.

3. Tables 6-11 give the vertical distribution and range of temperature of all species of the six genera here treated, with one or more representatives in the trenches (hadal species). In the five genera of Asellota only 6 % of the altogether 85 species are exclusively confined to the shelf area (always in high latitudes), while 75 % never occur on the shelf. 51 % do not go deeper than 2000 m, and 36 % are only found beyond this depth, thus being confined to the abyssal and hadal regions. 9 % have so far exclusively been found in the latter of these zones. 66 % of the species have always been taken at temperatures below 3°C, and 15 % only at negative temperatures. Most of the species seem to be rather stenotherm. *Storthyngura* is the most pronounced deep-sea genus (with none of the twelve species above 400 m and 5°C). In *Leptanthura* (Anthuridea) half of the species live in shallow water and at high temperatures.

4. The three abysso-hadal or bathyo-hadal species have a vertical range of several thousand metres (4300, 5400, and 6750 m). The remaining nine species are exclusively confined to the trenches (one with a vertical range of 1650 m, the others with at most 400 m). In the Kermadec Trench the great majority of specimens were caught at depths between 6000 and 7000 m; a similar accumulation of isopods within a special depth-interval seems to occur in the Kurile-Kamtchatka Trench, recently investigated by the Russians.

5. All the genera with hadal representatives are cosmopolitan, but only 5 % of their species have so far been found in more than one ocean. Remarkably many species (except of *Leptanthura)* are found in arctic-subarctic or antarctic-subantartic regions; all those caught in equatorial areas show submergence, none of then having been taken above 700-1000 m, and the majority living deeper than 2000 m.

6. None of the hadal species are found in more than one of the trenches investigated. The predominance of isopods in the Kermadec Trench – compared to the number in the other trenches surveyed by the Galathea Expedition – is extraordinary and in contrast to most other major groups with hadal representatives. 77 % of the isopod species, so far recorded from the trenches, are peculiar to these; this is more than in any other of the above named, major groups (except Actinaria).

7. In most cases the nearest relative of each of the hadal species is one of the species which is nearest to it geographically. The place of origin of the hadal species is certainly cold areas in the arctic and especially the antarctic regions from where the ancestors have spread into the abyssal region and from there descended into the trenches. This invasion of Isopoda probably took place fairly recently.

8. The general appearance of the hadal species is remarkably similar to that of their abyssal, bathyal, and even sublittoral relatives. They are almost all considerably larger, less spiny, and generally less calcified than these. The colour is preferably purely white, and they are all blind.

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LES PYCNOGONIDES DU GENRE NYMPHON

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Introduction

Parmi les Pycnogonides capturés au cours de l'Expédition de la "Galathea" se trouvent trois espèces appartenant au genre *Nymphon*. Une d'entre elles a été recueillie au-dessous de 6000 mètres de profondeur, la deuxième à 5850 m et la troisième à 4410 m. Il s'agit de trois espèces nouvelles dont on trouvera ci-dessous la description.

Jusqu'à ce jour, le record de profondeur pour ce genre était détenu par le *N. procerum* Hoek pris par l'Expédition Suèdoise de l'"Albatross" à 4600 m au N. W. des Açores, et le record de profondeur pour les Pycnogonides appartenait au *Colossendeis brevipes* Hoek rapporté, par l'Expédition du "Challenger", du S. W. de l'Atlantique et provenant de 4846 m. Les captures de la "Galathea", au moins pour deux espèces, battent donc tous les records:

Le *Nymphon galatheae* nov. sp. a été capturé à deux stations situées dans la fosse des Kermadec, au N. de la Nouvelle Zélande, par 5850 m de profondeur à la Station 654 et par 5340 m à la Station 661.

Le *Nymphon femorale* nov. sp. a été pris entre 6490 et 6650 m de profondeur, dans la Mer de Banda (St. 497), et, en outre, à deux stations moins profondes (St. 279: 4300 m; St. 282: 4040 m) dans l'Océan Indien entre les Seychelles et Ceylan.

Quant au *Nymphon inerme* nov. sp., il a été pris, comme le premier, dans la fosse des Kermadec, mais seulement à la profondeur de 4410 m.

Nymphon galatheae, nov. sp.
(Fig. 1 à 4)

MALE. – *Corps* finement chagriné, orné à la base du céphalon d'un tubercule dorsal, transverse, pourvu, de chaque côté, d'une courte pointe angulaire, et, sur le bord postérieur des trois segments suivants, d'un tubercule median géminé. Bord distal des prolongements latéraux et des premières coxas portant également en dessus un tubercule géminé, moins saillant.

Tronc assez grêle, prolongements latéraux très

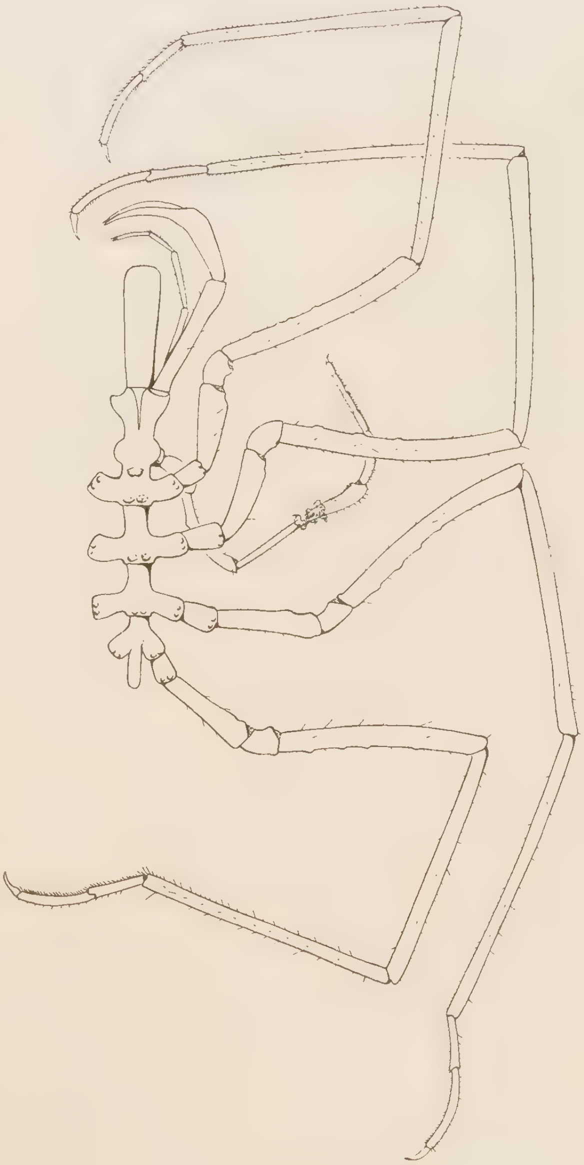
Fig. 1. *Nymphon galatheae* ♂

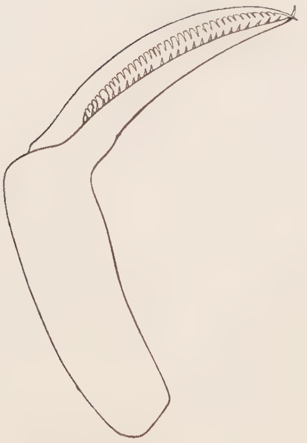

Fig. 2. *Nymphon galatheae* ♂, extrémité de la chélicère.

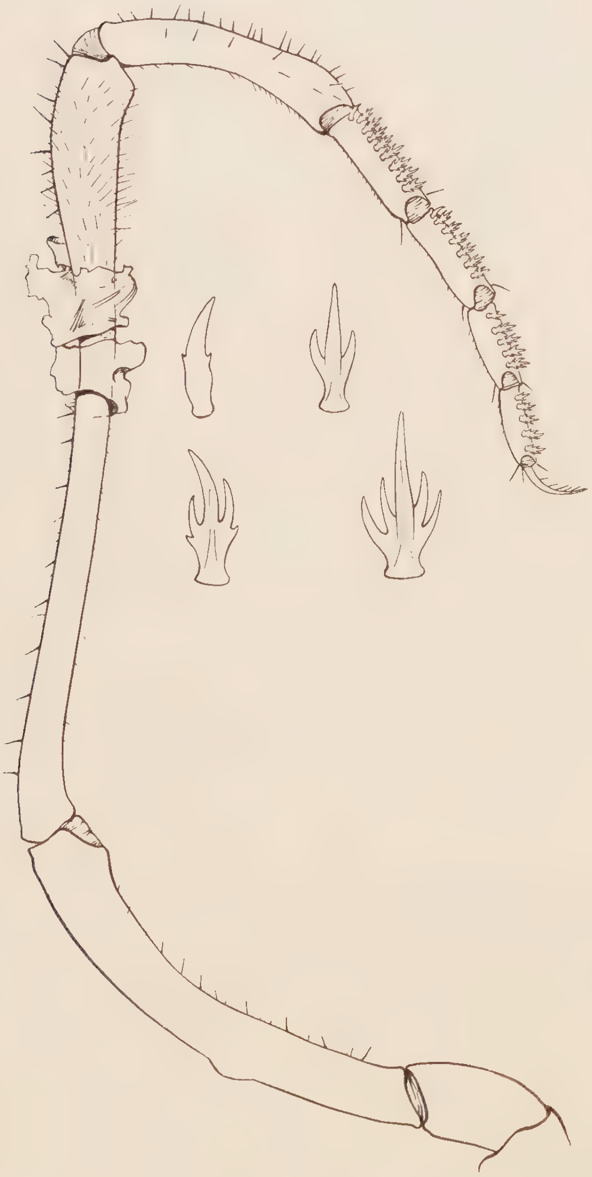

Fig. 3. *Nymphon galatheae* ♂, ovigère.

largement séparés les uns des autres, plus que de leur diamètre. Pas d'yeux, ni de tubercule oculaire à moins qu'il ne faille considérer comme tel celui, déjà signalé, à la base du céphalon. Insertion des ovigères placée en avant des premiers prolongements latéraux, à une distance supérieure à leur diamètre. Abdomen cylindrique, son extrémité arrivant à l'aplomb du bord distal des premières coxas de la quatrième paire de pattes.

Trompe cylindrique, aussi longue que l'ensemble du céphalon et du premier segment, un peu plus longue que le scape des *chélicères* qui est environ 7 fois plus long que large et sensiblement de même longueur que la pince. Doigts de même longueur que la main cylindrique et de même diamètre que le scape. Le doigt fixe porte 22 à 30 épines longues et largement espacées; le doigt mobile 32 à 38, plus courtes et plus serrées.

Palpes beaucoup plus longs que la trompe; les articles 2 et 3 subégaux entre eux, les articles 4 et 5 également subégaux entre eux, mais de moitié plus courts que les précédents.

Ovigères très allongés, quatrième article nettement arqué pourvu à son tiers proximal d'un tubercule; cinquième article, au moins une fois et demie plus long que le précédent, renflé en massue à son tiers distal; article 7 portant 9 épines; article 8 portant 7 épines, articles 9 et 10 portant chacun 5 épines spéciales à deux paires de pointes latérales; griffe ornée de 6 fines épines, l'épine proximale des articles 7 à 10 a toujours un nombre moindre de pointes latérales.

Troisièmes pattes ambulatoires: coxas 1 et 3 égales entre elles et, chacune, de moitié plus courte que la coxa 2; fémur plus court que le tibia 1, portant quatre pores glandulaires; tibia 2 faisant le double de l'ensemble du tarse, du propode et de la griffe; tarse une fois et demie plus court que le propode qui est légèrement arqué et se termine par une seule courte et robuste griffe.

Chez les femelles toutes les deuxièmes coxas montrent un large orifice sexuel. Chez les mâles les orifices sexuels se trouvent seulement sur les deux paires postérieures. Les deux paires de fémurs antérieurs n'ont que trois pores glandulaires.

La femelle se distingue par les deuxièmes coxas beaucoup plus courtes, très dilatées ainsi que les troisièmes coxas.

Dimensions en millimètres

Longueur de la trompe	2,5
Diamètre de la trompe à la base: 0,7; au sommet.....	0,85
Longueur du tronc	3,9

Longueur du céphalon	2,1
Largeur du bord frontal	1,4
Largeur du cou	0,6
Largeur au niveau des deuxièmes prolongements latéraux	2,3
Longueur de l'abdomen	1

Palpe:		*Troisième patte:*			
art. 2	1,9	Coxa 1	0,83	tibia 1	6,4
– 3	1,3	– 2	2,5	– 2	6,8
– 4	0,66	– 3	0,83	tarse	1,2
– 5	0,83	fémur	5	propode	2,8
				griffe	0,5

Ovigère:			
art. 4	2	art. 8	0,51
– 5	4	– 9	0,4
– 6	1,2	– 10	0,4
– 7	0,58	griffe	0,3

REMARQUES. – Les *Nymphon* dépourvus de griffes auxiliaires et dont les ovigères sont insérés largement en avant des premiers prolongements latéraux sont les *N. hamatum* Hoek, *procerum* Hoek, *profundum* Hilton, *noctum* Hilton et *tenuimanum* Hodgson. Toutes ces espèces sont aveugles de même que les *N. compactum* Hoek, *typhlops* (Hodgson) et *hedgpethi* Stock, mais ces trois dernières espèces ont leurs ovigères contiguës aux premiers prolongements latéraux.

Des cinq premières espèces, le *N. galatheae* paraît se rapprocher surtout du *N. profundum:* il a, comme lui, la griffe des ovigères armée d'épines peu nombreuses (6), les épines spéciales des articles distaux des ovigères ornées seulement, de chaque côté, d'une paire de pointes et l'abdomen atteignant le bord distal des quatrièmes coxas; mais il en diffère par ses tarses beaucoup plus courts que les propodes et par le plus grand nombre de dents au doigt mobile des chélicères. Nous n'avons malheureusement du *N. profundum,* représenté par un seul individu femelle, que la description succinte de HILTON (1942), à laquelle HEDGPETH (1949) a ajouté quelques figures. HEDGPETH pense même que le *N. noctum* lui serait identique, cependant celui-ci a les tarses plus longs que les propodes, l'abdomen plus court et la griffe des ovigères armée de 45 à 50 dents.

En tout cas, le *N. galatheae* se distingue de toutes ces espèces, dont le corps est lisse, par les tubercules dorsaux qui ornent le céphalon, les trois segments suivants et le bord distal des prolongements latéraux et des premières coxas.

Toutes ces espèces, à l'exception du *N. hedgpethi* dragué à 683 m dans l'Insulinde, sont des formes de grande profondeur, toutes capturées au-dessous de 2000 m et dont certaines, tel que le *N. procerum,* peuvent vivre au-dessous de 4500 m.

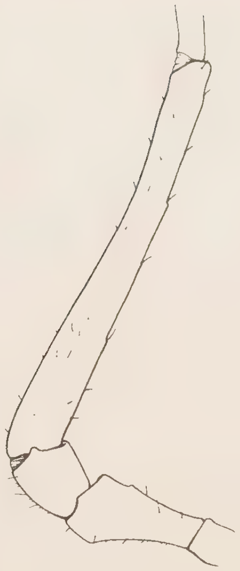
Fig. 4. *Nymphon galatheae* ♀, coxas et fémur de la 2e paire de pattes.

Quant au *N. galatheae,* il a été rencontré par la "Galathea" à deux stations situées dans la fosse de Kermadec, l'une (St. 661 : 36°07'S, 178°62'W) par 5340 m et l'autre (St. 654; 32°10'S, 175°54'W) par 5850 m de profondeur. A la première station une seule femelle a été capturée; à la station 654 il a été pris 4 ♂ et 8 ♀.

Le mâle que nous avons figuré porte sur ses ovigères les traces de pelotes d'oeufs. L'éclosion avait eu lieu au moment de la capture, et aucun oeuf n'est demeuré en place; il semble qu'ils devaient être peu nombreux, peut-être assez gros à en juger par les débris d'une mue d'un des embryons, déjà pourvu de fortes chélicères.

Nymphon femorale, nov. sp.
(Fig. 5 à 7)

MALE. – *Corps* entièrement lisse sauf, de chaque côté, un petit tubercule dorsal entre l'insertion des premiers prolongements latéraux et celle des ovigères.

Tronc grêle; prolongements latéraux séparés les uns des autres par un intervalle supérieur à leur diamètre; pas d'yeux, ni de tubercule oculaire. Insertion des ovigères placée à égale distance des premiers prolongements latéraux et du bord frontal du céphalon.

Abdomen acuminé, légèrement redressé, son extrémité dépassant en arrière le bord distal des premières coxas de la quatrième paire de pattes.

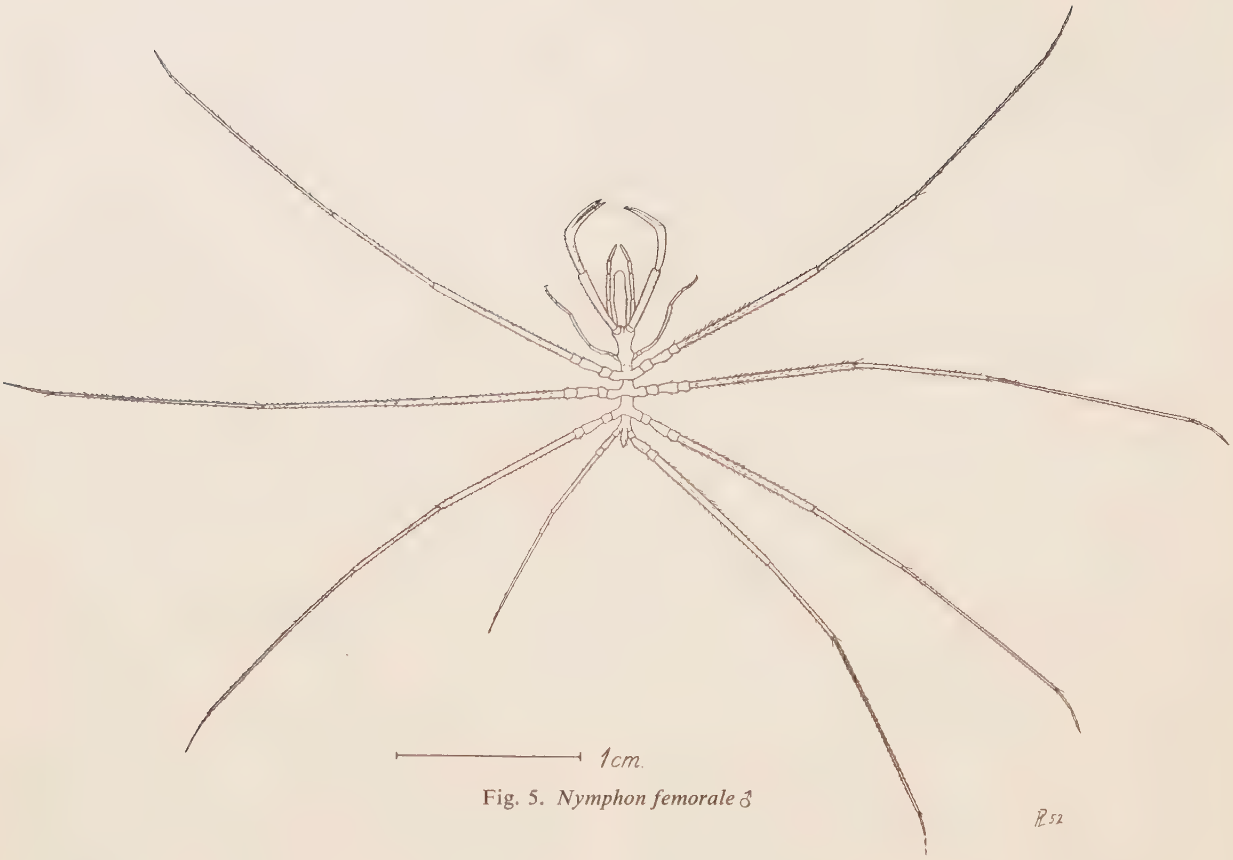

Fig. 5. *Nymphon femorale* ♂

Trompe cylindrique, faiblement dilatée en son milieu, plus longue que l'ensemble du céphalon et du premier segment.

Chéliceres grèles et longues; le scape plus long que la trompe et une fois et demie aussi long que la main à peine plus courte que les doigts. Doigt mobile armé de 50 à 53 épines, le doigt fixe de 38 à 42.

Bord distal du troisième article des *palpes* arrivant à l'aplomb du bord antérieur de la trompe; article 2 le plus long; article 3 un peu plus long que l'ensenble des deux articles distaux; l'article 5 le plus court.

Bord distal du cinquième article des *ovigères*, arrivant à l'aplomb du bord antérieur de la trompe, article 4 sensiblement plus court que le 5 qui est légèrement renflé en massue au sommet et environ 3 fois plus long que l'article 6; l'article 4 pourvu d'un fort tubercule; les deux articles terminaux égaux entre eux et de même longueur que la griffe. 13 + 10 + 7 + 8 épines spéciales, longues et pourvues de nombreuses denticulations; griffe armée de 10 à 13 longues épines.

A la *troisième patte*, première et troisième coxas subégales, leur ensemble de même longueur que la deuxième; fémur très allongé, nettement plus long que le premier tibia, le deuxième tibia au moins une fois et demie aussi long que le premier; tarse un peu plus long que le propode; pas de griffes auxiliaires. – Orifices sexuels sur les coxas des deux dernières paires.

Femelle. – Orifice sexuel sur les coxas des quatre paires.

Dimensions en milimetres

Longueur de la trompe	6
Diamètre de la trompe	1,5
Longueur du tronc	8
Longueur du céphalon	5
Largeur au niveau de la deuxième paire de pattes	5
Longueur de l'abdomen	2

Palpe:		*Ovigére:*			
art. 2...	3,5	art. 4...	4	art. 8...	0,65
– 3...	3	- 5...	5,5	– 9...	0,5
– 4...	1,5	– 6...	1,9	– 10...	0,5
– 5...	1	– 7...	1	griffe	0,5

Troisième patte:

Coxa 1...	1,5	Tibia 1...	14
– 2...	3	– 2...	23,5
· 3...	2	Tarse	2,5
Fémur ...	19	Propode ..	2
		Griffe	1,25

REMARQUES. – C'est, semble-t-il du *N. noctum* Hilton que cette espèce se rapproche le plus; elle a, comme lui, les tarses à peu près de même longueur

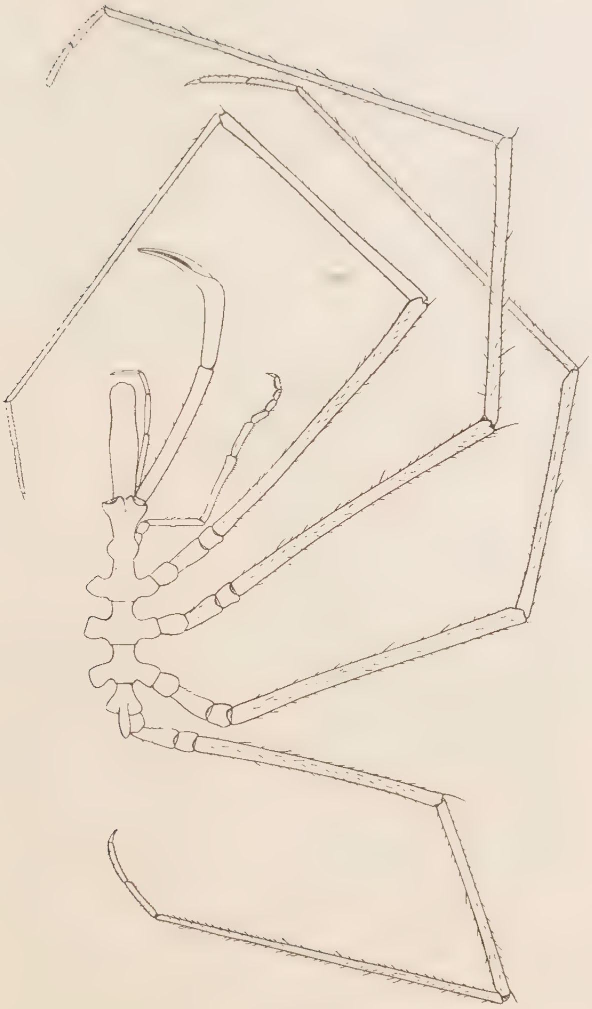

Fig. 6. Nymphon femorale ♀

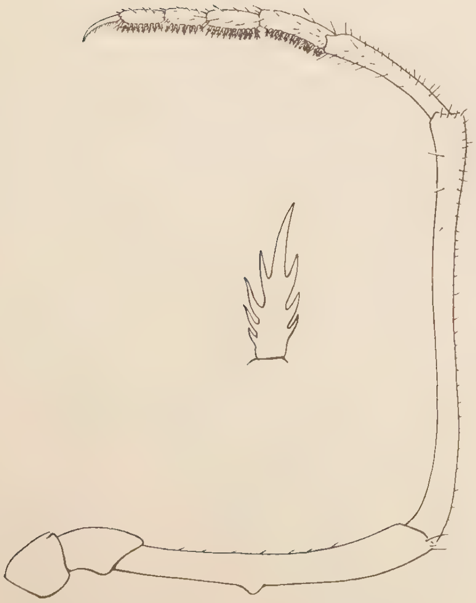

Fig. 7. *Nymphon femorale* ♂, ovigère.

que les propodes et de nombreuses dents aux doigts des chélicères. Mais elle s'en distingue par les épines spéciales des ovigères, plus allongées, plus nombreuses et à plus nombreuses denticulations. En outre, le *N. femorale* diffère de toutes les espèces de ce groupe par la longueur des fémurs, qui dépasse très largement celle des premiers tibias.

Station n° 279: lat. 1°00′N; long. 76°17′E (entre les Seychelles et Ceylan), profondeur: 4300 m, 1 ♂ mutilé.

Station n° 282: lat. 5°32′N; long. 78°21′E (entre les Seychelles et Ceylan), profondeur: 4040 m, 6 ♂, 5 ♀, 9 juv.

Station n° 497: lat. 5°18′S; 131°18′E (Mer de Banda), profondeur: 6490-6650 m, 1 ♂ juv.

Cette belle espèce, qui peut atteindre près de 14 cm d'envergure, semble ainsi caratéristique des grands fonds de l'Indo-W-Pacifique et peut y vivre en colonies assez prospères, puisqu'à la Stat. 282, il en a été pris d'un seul coup 20 individus. Sa capture dans la Mer de Banda par 6490-6650 m en fait le Pycnogonide le plus profond que l'on connaisse.

Nymphon inerme nov. sp.
(Fig. 8 à 10)

FEMELLE. – *Corps* très finement chagriné; une petite pointe dorsale aiguë de chaque côté, entre l'insertion des prolongements latéraux et celle des ovigères. Cou très étroit; céphalon brusquement élargi au bord frontal.

Tronc grèle; prolongements latéraux séparés les uns des autres par un intervalle n'excédant pas leur diamètre; pas d'yeux ni de tubercule oculaire. Insertion des ovigères nettement en avant des premiers prolongements latéraux. Abdomen cylindrique, dépassant en arrière le bord distal des premières coxas de la quatrième paire de pattes.

Trompe cylindrique, de même longueur que le céphalon et que les scapes des *chélicères,* plus courte que l'ensemble de la main et des doigts, ceux-ci 2 fois plus longs que la main. Le doigt mobile est armé de 15 dents et le doigt fixe de 14.

Palpes dépassant à peine en avant le sommet de la trompe; articles 2 et 3 subégaux; articles 4 et 5 courts, subégaux, ornés de longues soies raides, leur longueur faisant ensemble environ la moitié de l'article 3.

Ovigères très allongés, l'article 5 à peine plus long que l'article 4 et faisant à peine le double de l'article 6; articles 7, 8, 9 et 10 subégaux armés respectivement de 6, 5, 3, 5 épines simples, sans denticula-

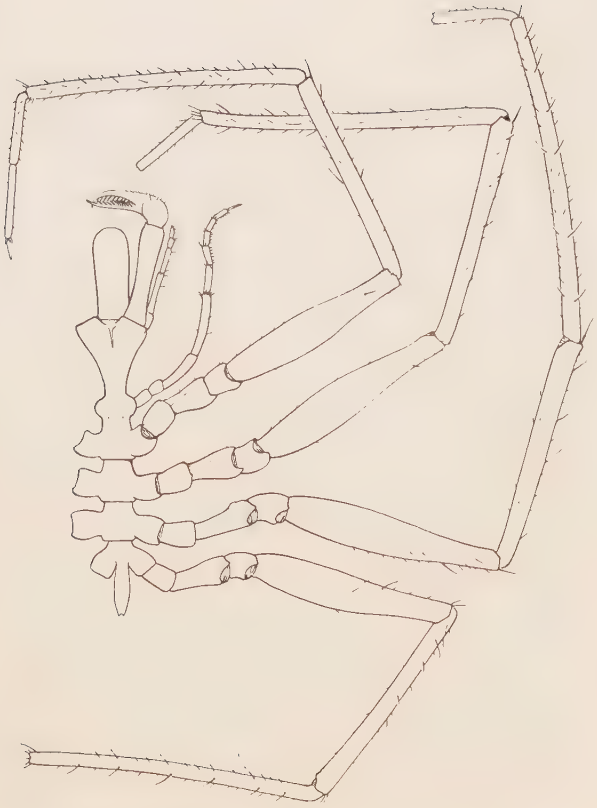

Fig. 8. *Nymphon inerme* ♀

tion et légèrement courbes; griffe pourvue de 5 à 6 épines dans sa moitié distale.

A la deuxième *patte ambulatoire,* la deuxième coxa est à peine plus longue que l'ensemble des deux autres subégales; fémur beaucoup plus court que le premier tibia qui est lui-même nettement plus court que le deuxième; tarse de même longueur que le propode; longueur de la griffe principale contenue 2 fois et demie dans celle du propode; griffes auxiliaires faisant environ $^1/_5$ de celle-ci.

Orifices sexuels bien visibles sur les deuxièmes coxas des quatre paires de pattes.

Dimensions en millimetres

Longueur de la trompe	2
Diamètre de la trompe	0,8
Longueur du tronc	3
Longueur du céphalon	2,5
Largeur au niveau de la deuxième paire de pattes	1,9
Longueur de l'abdomen	1,2

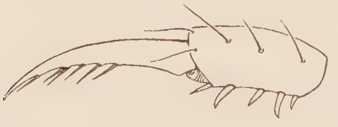

Fig. 9. *Nymphon inerme* ♀, article 10 et griffe de l'ovigère.

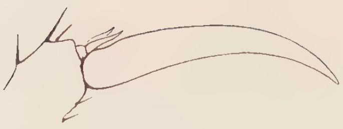

Fig. 10. *Nymphone inerme* ♀, griffes de la 2e paire de pattes.

Palpe:	*Ovigère:*	
art. 2... 1	art. 4... 1,1	art. 8... 0,3
– 3... 0,9	– 5... 1,5	– 9... 0,3
– 4... 0,25	– 6... 0,7	– 10... 0,3
– 5... 0,25	– 7... 0,45	griffe ... 0,3

Deuxième patte:

Coxa 1	0,8	Tibia 1	5,3
– 2	1,6	– 2	6,9
– 3	0,8	Tarse	2
Fémur	4,8	Propode	2
		griffe	0,75

Remarques. – Cette espèce appartient à un tout autre groupe que les précédentes, étant pourvue de griffes auxiliaires. L'absence d'yeux, la situation des ovigères, le petit nombre de dents aux doigts des chélicères, les faibles dimensions de la main, les tarses sensiblement de même longueur que les propodes, la brièveté des griffes auxiliaires sont ses principales caractéristiques. Mais il faut ajouter qu'elle se distingue de toutes les autres espèces du genre, sauf de *N. adareanum* Hodgson, et parfois de *N. molum* Hilton, par les épines spéciales des ovigères qui sont dépourvues de denticulation.

Station n° 663. Lat.: 36°31'S; long.: 178°38'W. Fosse des Kermadec profondeur 4410 m. Un seul exemplaire ♀, type de l'espèce.

Remarques generales

La famille des *Nymphonidae* est, avec celle des *Colossendeidae,* la plus richement représentée dans les abysses; le seul genre *Nymphon* compte 10 espèces qui descendent au dessous de 2000 m, auxquelles il faut ajouter les 3 espèces de la "Galathea". En voici la liste:

Nymphon gracilipes Miers	10-3055 m
– longicoxa Hoek	1266-2570 m
– compactum Hoek	2013-3248 m
– hamatum Hoek	2516-2928 m
– tenuimanum Hodgson	3398 m
– noctum Hilton	2871 m
– profundum Hilton	3231 m
– longicollum Hoek	4071 m
– procerum Hoek	3948-4600 m
– typhlops (Hodgson)	2450 m
– galatheae, nov. sp.	5340-5850 m
– femorale, nov. sp.	4040-6650 m
– inerme, nov. sp.	4410 m

Il est à remarquer que, parmi ces 13 espèces, deux seulement sont pourvues de griffes auxiliaires: *N. gracilipes* et *N. inerme* et que toutes celles qui n'ont jamais été rencontrées au-dessus de 2000 m, c'est-à-dire 11 sur 13, sont aveugles et qu'enfin, 3 espèces seulement: *N. compactum, longicollum* et *typhlops* ont l'insertion des ovigères contiguë à celle des premiers prolongements latéraux.

L'absence d'yeux et de griffes auxiliaires, l'insertion antérieure des ovigères sont, à vrai dire, les seuls caractères morphologiques qui se présentent avec une particulière fréquence chez les Nymphon abyssaux. Rien d'autre à l'examen ne les distingue des espèces côtières.

Il faut signaler, cependant, que chez les femelles que j'ai pu observer, les deuxièmes coxas de *toutes* les pattes ont un orifice sexuel extrêmement développé. La grande taille et le nombre de ces orifices sont peut-être en rapport avec le volume des oeufs assez chargés de vitellus pour permettre aux larves d'accomplir une grande partie de leur développement avant de quitter les ovigères des mâles. Nous n'avons malheureusement que peu de renseignements sur ce point. Il n'est pas douteux que la physiologie de ces êtres vivant à ces énormes pressions, à l'obscurité totale, à très basse température doit différer grandement de celle des formes côtières; mais on doit constater que leur morphologie n'en rend pas compte.

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LES PYCNOGONIDES

(EXCL. LE GENRE NYMPHON)

Par LOUIS FAGE

Paris

Introduction

Le Docteur Anton Fr. Bruun a bien voulu me confier l'examen des Pycnogonides récoltés au cours de la croisiere de la "Galathea". Je le remercie vivement de m'avoir ainsi fourni l'occasion d'étudier des formes parmi les plus caractéristiques des grandes profondeurs océaniques. Certains des échantillons rapportés ont été dragués en effet par plus de 6500 mètres de profondeur et la grande majorité des récoltes proviennent de fonds excédents 4000 mètres.

Dans un précédent travail (1956) nous avons fait connaître les *Nymphon* rapportés par l'Expédition, dont l'un d'entre eux, le *N. femorale* Fage, pris à 6650 m de profondeur, est à ce jour le Pycnogonide le plus profond.

On ne connaissait jusqu'ici que sept espèces ayant été capturées au-dessous de 4000 m: trois *Colossendeis (C. colossea* Wilson signalé jusqu'à 4140 m: *media* Hoek, jusqu'à 4032 m; *brevipes* Hoek, jusqu'à 4846 m), un *Pipetta (P. longituberculata* Turpajeva, jusqu'à 4850 m); deux *Nymphon (N. longicollum* Hoek à 4071 m et *procerum* Hoek jusqu'à 4600 m); un *Ascorhynchus (A. abyssi* G. O. Sars jusqu'à 4392 m).

Nous pouvons maintenant doubler cette liste avec trois *Nymphon* et quatre *Colossendeis* ce qui porte à quatorze le nombre des Pycnogonides vivant au-dessous de 4000 m de profondeur.

Voici la liste des espèces rapportées par la "Galathea" avec les profondeurs extrêmes auxquelles elles ont été capturées au cours de cette croisière.

Nymphonidae

Nymphon galatheae Fage, 5890 m
– *femorale* Fage, 6490-6650 m
– *inerme* Fage, 4390 m

Pallenidae

Pallenopsis scoparia n. sp., 1520 m
– *mollissima* (Hoek), 1560 m

Ammotheidae

Ammothella gigas n. sp., 1520 m
Ascorhynchus glaber Hoek, 1520 m

Colossendeidae

Colossendeis angusta G. O. Sars, 5340 m
– *japonica* Hoek, 4390 m
– *bruuni* n. sp., 4390 m
– *michaelsarsi* Olsen, 920 m
– *megalonyx* Hoek, 3410 m
– *colossea* Wilson, 3590 m
– *cucurbita* Cope, 4400 m
– *macerrima* Wilson, 3670 m
– sp.? 3670 m

Ces 16 espèces sont représentées par 83 individus capturés à 16 stations différentes. 6 stations (279-283-491-497-601-724) n'ont donné qu'un seul individu; 2 stations (607-661) 2 individus; 1 station (241) 3 individus; 1 station (726) 4 individus; 3 stations (217-663-668) 5 individus; 1 station (654) 12 individus; 2 stations (282-716) 20 individus. 9 de ces stations n'ont rapporté qu'une seule espèce, représentée par 1-2-12 ou 20 exemplaires; 2 stations ont rapporté 2 espèces; 5 stations, 3 espèces.

Cette statistique montre que si, le plus souvent, la drague ou le chalut n'a rencontré ou remonté que des individus isolés, il arrive que les individus appartenant à une ou plusieurs espèces se trouvent groupés sur le fond d'une facon assez dense pour que nos misérables engins, maniés au hasard avec difficulté, puissent capturer d'un seul coup 20 individus par 3590 m et 4050 m de profondeur. L'une de ces stations privilégiées (716) se trouve dans le Golfe de Panama et l'autre (282) dans les parages de Ceylan. La première a livré 3 espèces différentes de *Colossendeis: C. colossea, cucurbita* et *macerrima,* la seconde n'a livré qu'une seule espèce: le *Nymphon femorale.*

La lecture de la liste ci-dessus fait ressortir, en outre, le nombre élevé des espèces nouvelles rencontrées ce qui tient plus probablement à l'efficacité des méthodes de capture qu'à l'existence d'une faune proprement abyssale qu'il restait à découvrir.

Il est cependant remarquable que, si l'on dresse la liste des espèces prises au voisinage de 2000 m ou plus profondément, toutes appartiennent à cinq familles seulement.

Cette liste comprend, en effet, les formes suivantes:

Nymphonidae

Paranymphon spinosum Caullery, 385-2250 m
Boreonymphon robustum (Bell), 28-2278 m
Nymphon australe-caecum Gordon, 1266 m
– *compactum* Hoek, 2013-3248 m
– *dissimile* Hedgpeth, 1924 m
– *femorale* Fage, 4050-6650 m
– *galatheae* Fage, 5340-5890 m
– *gracilipes* Miers, 10-3055 m
– *hamatum* Hoek, 2516-2928 m
– *inerme* Fage, 4390 m
– *longicollum* Hoek, 3948-4600 m
– *longicoxa* Hoek, 1265-2570 m
– *longitarse* Kröyer, littoral à 1690
– *noctum* Hilton, 2871 m
– *procerum* Hoek, 3948-4600 m
– *profondum* Hilton, 3231 m
– *tenuimanum* Hodgson, 3398 m
– *typhlops* (Hodgson), 2450 m

Pallenidae

Callipallene acus (Meinert), 1000-2700 m
Pallenopsis calcanea Stephensen, 1000-2500 m de câble[1]
– *californica* Schmk., 1820-2362 m
– *longirostris* Wilson, 144-3064 m
– *mollissima* (Hoek), 924-3431 m
– *pilosa* (Hoek) 160-3567 m
– *profundis* Hilton, 2906 m
– *scoparia* Fage, 1520 m

Phoxichiliidae

Anoplodactylus neglecta Hoek, 2928 m

Ammotheidae

Ammothella gigas, n. sp., 1520 m
Ascorhynchus abyssi G.O. Sars, 1415-4392 m
– *agassizi* Schmk., 1007-2877 m
– *armatus* (Wilson), 402-2514 m
– *glaber* Hoek, 1520-2516 m

Colossendeidae

Colossendeis angusta G.O. Sars, 12-5340 m
– *articulata* Loman, 1944 m
– *bicincta* Schmk., 3059 m
– *brevipes* Hoek, 4846 m
– *bruuni*, nov. sp., 4390 m
– *clavata* Wilson, 1657-2493 m
– *colossea* Wilson, 865-4140 m
– *cucurbita* Cole, 1350-4400 m
– *hoeki* Gordon, 3112 m
– *japonica* Hoek, 703-4390 m
– *longitarsis* Gordon, 3111 m
– *macerrima* Wilson, 538-3670 m
– *media* Hoek, 4032 m
– *megalonyx* Hoek, 126-3485 m
– *michaelsarsi* Olsen, 920-1580 m
– *minuta* Hoek, 1084-2866 m
– *subminuta* Schmk., 2149 m
– *tenera* Hilton, 1458-2866 m
– sp.?, 3670 m
Pipetta australis Hodgson, 2450 m
– *longituberculata* Turpajeva, 4850 m
– *weberi* Loman, 2080 m

Ainsi, les 54 espèces que l'on peut qualifier d'abyssales se rangent toutes dans les familles des *Nymphonidae*, des *Pallenidae*, des *Phoxichiliidae*, des *Ammotheidae*, des *Colossendeidae*, et appartiennent à 10 genres seulement.

Si l'on cherche les caractères qu'ont en commun ces 10 genres et qui pourraient expliquer leur représentation exclusive à d'aussi grandes profondeurs, deux seuls paraissent évidents, ce sont leur indifférence au niveau d'habitat et leur préférence pour les basses températures.

Ils sont tous eurybathes: on connait de nombreux *Nymphon, Callipallene, Pallenopsis, Anoplodactylus, Ammothella, Ascorhynchus* littoraux ou côtiers et l'on pourrait citer des *Colossendeis* et *Pipetta* qui sont dans ce cas. Bien plus, parmi les espèces que nous avons qualifiées d'abyssales, il en est qui sont connues pour vivre également à faible profondeur; le *Paranymphon spinosum* a été pris à 385 m; le *Boreonymphon robustum* à 28 m; les *Nymphon gracilipes, longitarse* peuvent mener une existence littorale; les *Pallenopsis pilosa* et *longirostris* ont été rencontrés à 150 m environ de profondeur, l'*Ascorhynchus armatus* à moins de 500 m et le *Colossendeis angusta* a été signalé par Stephensen sur le littoral arctique.

Mais il faut remarquer – et c'est là un point important – qu'aucune de ces espèces, même celles qui ont une large répartition horizontale, ne devient littorale dans les mers tempérées. C'est aux plus hautes latitudes de son habitat (Péninsule de Taimyr) que le *Boreonymphon robustum* fréquente le bord de la mer, alors qu'on le trouve ailleurs au-dessous de 2000 m; c'est dans le Détroit de Cabot que le *Pallenopsis longirostris* a été pris par 144 m de profondeur, alors qu'aux Acores il vit à 3065 m; c'est au Groënland que le *Colossendeis angusta* devient littoral, alors que dans le Pacifique Sud (fosse de Kermadec) il peut s'enfoncer à 5340 m.

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[1] Espèce pélagique (?)

Ainsi se trouve indiquée la préférence de toutes ces espèces pour les basses températures. Préférence corroborée par le fait que dans l'Antarctique, où ils sont très richement représentés, les Pycnogonides sont rares au-dessous de 500 m et se trouvent surtout entre 2 et 350 m (I. GORDON 1932), et par le fait aussi qu'aucun Pycnogonide abyssal n'est connu en Méditerranée.

Si l'on ajoute à cela que les 10 genres auxquels appartiennent les espèces abyssales sont représentés dans les mers arctiques ou antarctiques, on peut dire que la température, chez ces formes eurybathes, joue un rôle important dans leur répartition verticale: non seulement celles-ci n'ont à faire aucun effort d'adaptation spécial pour supporter le froid des abysses, mais les basses températures qu'elles y trouvent y sont une raison de leur présence.

Si la température n'est pas un obstacle à leur vie dans les grands fonds, il semble que ces espèces puissent y trouver aussi leur nourriture habituelle. Les intéressantes observations de STEPHENSEN (1933), complétant à ce sujet celles d'APPELLÖF (1916), montrent qu'elles se nourrissent principalement d'Eponges, d'Actinies, d'Alcyonaires, de Gorgones, d'Hydroïdes, groupes bien représentés aux plus grandes profondeurs. STEPHENSEN a pu même préciser que dans l'Arctique le *Colossendeis proboscidea* (Sabine) se nourrit d'Eponges et que le *Boreonymphon robustum* vit sur les *Umbellula*.

Dans ces conditions on ne peut s'étonner que, par leur aspect extérieur, les formes abyssales diffèrent peu des formes côtières. Tout au plus peut-on noter le nombre proportionnellement élevé d'espèces à pattes démesurément allongées qui, chez certains *Colossendeis* peuvent donner à l'animal une envergure de 60 cm. C'est là un avantage incontestable pour des formes ayant à déambuler dans un milieu calme, sur la vase molle des grands fonds.

Comme autre particularité fréquente, il faut signaler la tendance à l'oblitération des yeux. Chez les *Nymphon* en particulier, toutes les espèces connues au-dessous de 2000 m sont aveugles, tandis qu'aux niveaux supérieurs, seul le *Nymphon australe* a une variété aveugle (var. *caecum* Gordon) qui, d'ailleurs par rapport au type oculé, vit beaucoup plus profondément: 1266 m au lieu de 40 à 391 m. Les trois espèces de *Pipetta* abyssales sont aveugles, tandis que la forme côtière est oculée. Le *Paranymphon spinosum*, le *Callipallene acus* sont également aveugles, de même que les *Ascorhynchus agassizi* et *armatus* et l'*Ammothella gigas*. Quant aux *Colossendeis*, la grande majorité des espèces citées sont aveugles ou ont des yeux rudimentaires. Les *Pallenopsis*, en revanche, ont tous des yeux plus ou moins bien développés, extrêmement rudimentaires toutefois chez le *P. calcanea*.

Remarquons à ce propos que les Pycnogonides de la "Galathea" proviennent de quatre régions différentes:

1° EST AFRICAIN (Stat. 217, prof. 3410 m et stat. 241, profond. 1520 m). A la première station ont été pris les *Colossendeis angusta* et *macerrima* dont la distribution s'étend à tous les Océans, et le *C. megalonyx* connu aussi des Mers du Sud.

A la deuxième station, et à une profondeur beaucoup moindre, ont été capturées 2 espèces nouvelles: *Pallenopsis scoparia, Ammothella gigas* et une espèce *Ascorhynchus glaber* connu aussi des Mers du Sud (Crozet).

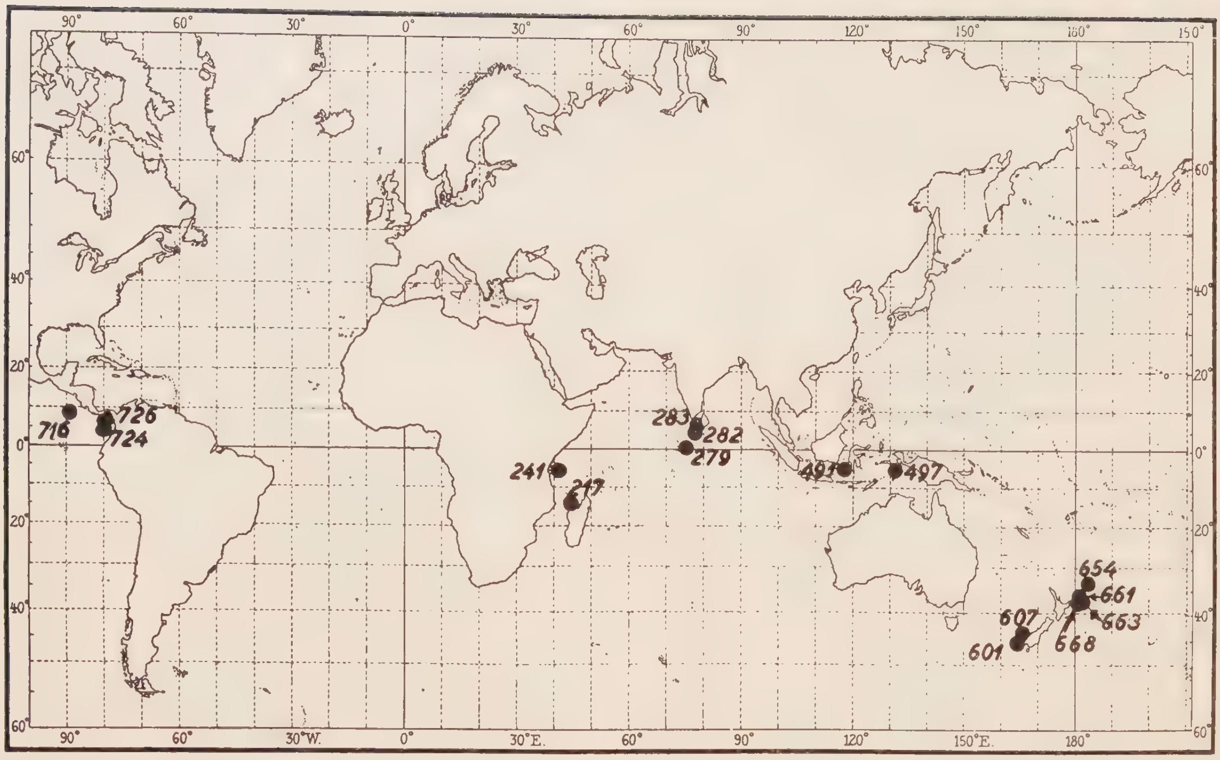
2° EST INDIEN, aux stations 279 et 282, situées dans les parages de Ceylan à plus de 4000 m de profondeur, a été remonté un *Nymphon* nouveau: le *N. femorale*, qui a été pris également à 6650 m de profondeur dans la Mer de Banda.

A la station 283, près de Ceylan, mais à moins de 1000 m, a été rencontré le *Colossendeis michaelsarsi* connu de l'Est Atlantique.

De la station 491 (profondeur 1560 m) dans la Mer de Java, a été ramené le *Pallenopsis mollissima* qui semble propre à l'Indo-W-Pacifique.

3° NOUVELLE-ZELANDE. Nous retrouvons là, outre les *Colossendeis colossea* (st. 668) et *angusta* (st. 607 et 661) cosmopolites, les *C. cucurbita* (st. 601, prof. 4400 m et 668, prof. 2640 m) connu du S. de l'Australie, des Galapagos et aussi des Açôres et que nous retrouvons dans le Golfe de Panama (st. 716), et le *C. japonica*, (st. 663, prof. 4390 m) des mers du Japon, en même temps qu'une espèce nouvelle, le *C. bruuni*.

4° GOLFE DE PANAMA. Les trois stations 716 (prof. 3590 m), 724 (prof. 3190 m) et 726 (prof. 3670 m) n'ont livré que les *Colossendeis* ubiquistes *colossea, macerrima, angusta* et le *C. cucurbita* déjà pris dans la région précédente.



Côte de l'E-africain. – Stat. 217: *Colossendeis angusta, C. macerrima, C. megalonyx.* – Stat. 241: *Ammothella gigas, Ascorhynchus glaber, Pallenopsis scoparia.* – E-Indien. – Stat. 279 et 282: *Nymphon femorale.* – Stat. 283: *Colossendeis michaelsarsi.* – Stat. 491: *Pallenopsis mollissima.* – Stat. 497: *Nymphon femorale.* – Nouvelle-Zélande. – Stat. 601: *Colossendeis cucurbita.* – Stat. 607: *Colossendeis angusta.* – Stat. 654: *Nymphon galatheae.* – Stat. 661: *Nymphon galatheae, Colossendeis angusta.* – Stat. 663: *Nymphon inerme, Colossendeis bruuni, C. japonica, C. cucurbita.* – Stat. 668: *Colossendeis colossea, C. cucurbita.* Golfe de Panama. – Stat. 716: *Colossendeis colossea, C. cucurbita, C. macerrima.* – Stat. 724: *Colossendeis colossea.* – Stat. 726: *Colossendeis angusta, C. macerrima, Colossendeis* sp. ?.

Ce serait une erreur de croire cependant qu'aucune barrière n'interdit, même aux espèces qui semblent les plus favorisées, l'accès aux plus grandes profondeurs. Nous voyons, en effet, le nombre de celles-ci diminuer au fur et à mesure que l'on pénètre plus profondément.

Pour les *Colossendeis,* par exemple, tandis que le *C. michaelsarsi* n'a pas été pris au-dessous de 1580 m, le *C. angusta* atteint 5340 m. Entre ces deux extrèmes se placent les *C. megalonyx* (3485 m), *colossea* (4140 m), *macerrima* (3670 m), *media* (4032 m) et, au-delà, on ne trouve plus, outre le *C. angusta,* que les *C. cucurbita* (4400 m), *japonica* et *bruuni* (4390 m), *brevipes* (4846 m).

Chez les *Nymphon* existent de plus grandes possibilités puisque c'est à ce genre qu'appartiennent les Pycnogonides les plus profonds; et, pourtant au delà de 3500 m nous n'en connaissons que cinq espèces *N. longicollum* (4071 m), *inerme* (4390 m), *procerum* (4600 m), *galatheae* (5890 m) et *femorale* (6650 m).

Parmi les autres genres, trois seulement ont des représentants au-dessous de 3500 m: *Pallenopsis,* avec une espèce *(P. pilosa* 3567 m), *Ascorhynchus,* avec une espèce *(A. abyssi* 4392 m), *Pipetta,* avec une espèce également *(P. longituberculata* 4850 m).

On constate donc qu'à ce niveau un premier tri s'est d'abord opéré parmi les genres dont il ne subsiste plus que cinq, et ensuite parmi les espèces dont treize seulement peuvent être citées.

Mais, dans quelle mesure ces données sont-elles assez représentatives de la réalité pour permettre des conclusions valables? Un premier fait doit rendre très prudent à cet égard: c'est la difficulté des captures, accrue avec la profondeur. Il n'est pas douteux que manier une drague ou un chalut à 4000 m est une opération délicate et dont l'efficacité reste aléatoire. Il faudrait donc accumuler les opérations de cette sorte pour avoir quelque idée du peuplement à pareille profondeur.

D'autre part, les grandes fosses océaniques représentent des accidents isolés de peu d'étendue et sont largement distantes les unes des autres: 6.5 % seulement de la surface des sédiments se trouvent au de là de 5460 m de profondeur et ces fosses sont inégalement répandues dans tous les océans. Il s'en suit que seules y pourront être rencontrées les espèces dont la répartition géographique les recouvre.

C'est pourquoi les formes cosmopolites : les *Colossendeis angusta, macerrima, colossea* et probablement *cucurbita* sont les seuls à avoir été rencontrés dans les principales fosses explorées par la "Galathea".

Leur localisation géographique peut expliquer, d'autre part, l'absence de certaines espèces dans les dragages profonds exécutés, sans doute, en dehors de leur aire de répartition.

Au surplus, étant donné notre ignorance de la biologie des espèces abyssales et, en particulier, des conditions nécessaires à leur reproduction et au développement de leurs larves, nous ne pouvons qu'enregistrer à ce point de vue les faits, déjà remarquables, apportés par les récentes Expéditions et n'en point tirer des conclusions prématurées.

Rappelons qu'un seul biologiste Théodore Monod (1954) a pu observer dans la région de Dakar au cours d'une plongée en Bathyscaphe par 1400 m de fond, plusieurs Pycnogonides déambulant lentement sur la vase. Il s'agissait vraisemblablement d'un *Colossendeis*. Il n'est pas interdit de penser que cet engin, perfectionné, permettra des observations précises sur ces animaux et sur les autres habitants des abysses.

Description des espèces

PALLENIDAE

Pallenopsis scoparia, nov. sp.

(Fig. 1 à 4)

Femelle. – *Corps* entièrement lisse et glabre. Tubercule oculaire en bouton arrondi, peu saillant, situé sur le bord frontal et portant quatre gros yeux faiblement pigmenté.

Tronc à segments nettement articulés, aucune ligne de suture entre le céphalon et le premier segment. Prolongements latéraux de même longueur que la largeur du tronc et séparés par un intervalle plus petit que leur diamètre. Abdomen dirigé horizontalement en arrière, légèrement dilaté au milieu, atteignant l'extrémité des premières coxas.

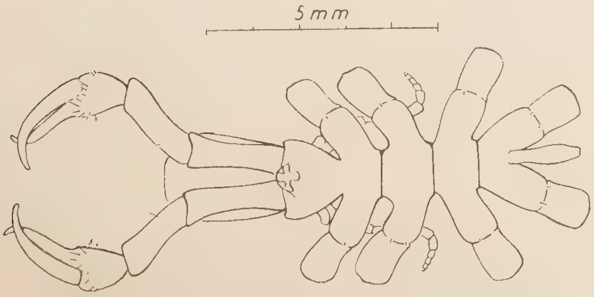


Fig. 1. *Pallenopsis scoparia,* nov. sp. – Vue dorsale.

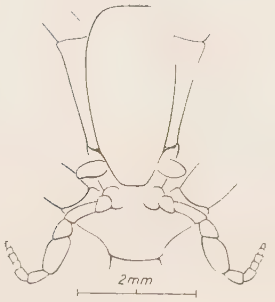


Fig. 2. *Pallenopsis scoparia,* nov. sp. – Cephalon vu par la face ventrale.

Trompe relativement courte et épaisse, plus courte que le tronc, élargie vers l'extrémité.

Chélicères à trois articles. Les deux articles du scape égaux ; la pince de moitié plus longue que chacun des articles du scape : la main aussi longue que large, ornée de quelques soies spiniformes à la base des doigts. Ceux-ci deux fois plus longs que la main, se croisant vers l'extrémité, leur marge lisse sans denticulations.

Palpes réduits à un moignon.

Ovigères pas plus longs que la trompe, mais formés de 10 articles ; les articles 3 et 4 dilatés ; les 4 articles distaux courts et subégaux portant quelques soies simples ; pas de griffe terminale.

Première paire de *pattes,* (les seules présentes sur notre exemplaire) grêles et longues : les coxas et le femur glabres sauf quelques soies distales ; le tibia 1 à peine plus grand que le tibia 2, ornés tous les deux et de chaque côté d'une série de longues soies plus de trois fois plus longues que le diamètre de

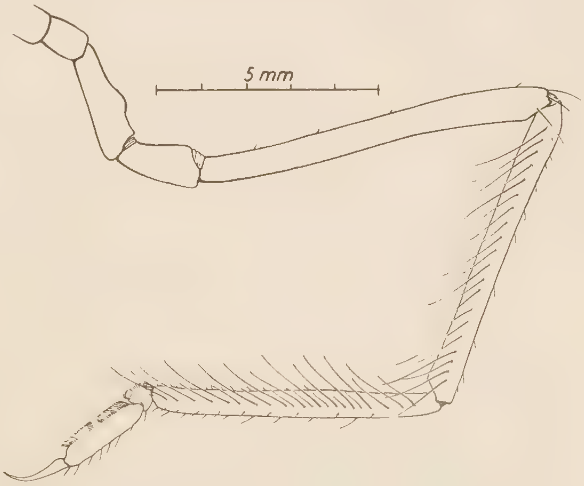


Fig. 3. *Pallenopsis scoparia,* nov. sp. – Patte de la première paire.

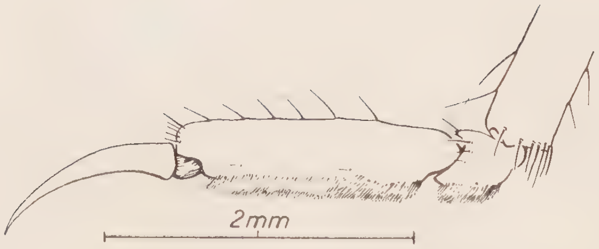


Fig. 4. *Pallenopsis scoparia,* nov. sp. – Tarse, propode et griffe.

l'article; tarse quatre fois plus court que le propode, sole sans épines mais pourvu comme le tarse d'une scopula extrêmement dense, formant une brosse à poils courts et serrés; griffe, un peu plus courte que le propode.

Orifice sexual sur les coxas 2.

Dimensions en millimètres

Longueur de la trompe	3
Diamètre de la trompe au sommet	1,5
Longueur du tronc	3,8
Longueur du céphalon	1,3
Largeur du corps au niveau des deuxièmes prolongements latéraux	2,7

Chélicères:		*Première patte*			
scape 1	2	Coxa 1	1	tibia 1	7
– 2	2	– 2	2	– 2	6,3
main	1	– 3	1,8	tarse	0,45
doigts	2	femur	8	propode	1,8
				griffe	1,1

Cette remarquable espèce, qui rappelle un peu le *Pallenopsis longirostris* Wilson, est caractérisée par son corps lisse et glabre, ses ovigeres réduits mais complets chez la femelle, la pilosité des tibias et surtout par les scopulas que portent les tarses et les propodes. Ce dernier caractère me paraît unique chez les Pycnogonides. Nous connaissons bien l'existence, en particulier dans le genre *Anoplodactylus,* de lamelles propodiales plus ou moins développées; mais je ne sache pas que des scopulas aient été jamais décrites.

Cet unique exemplaire a été dragué dans l'Océan Indien (Stat. 241): au large du Kenya 4°00 S; 41°27′ E, par 1520 m de profondeur. L'animal a perdu les trois paires de pattes postérieures.

Pallenopsis mollissima Hoek 1881

(Fig. 5 à 8)

C'est très probablement à cette espèce qu'appartient l'individu jeune capturé par la "Galathea" et dont voici les principaux caractères.

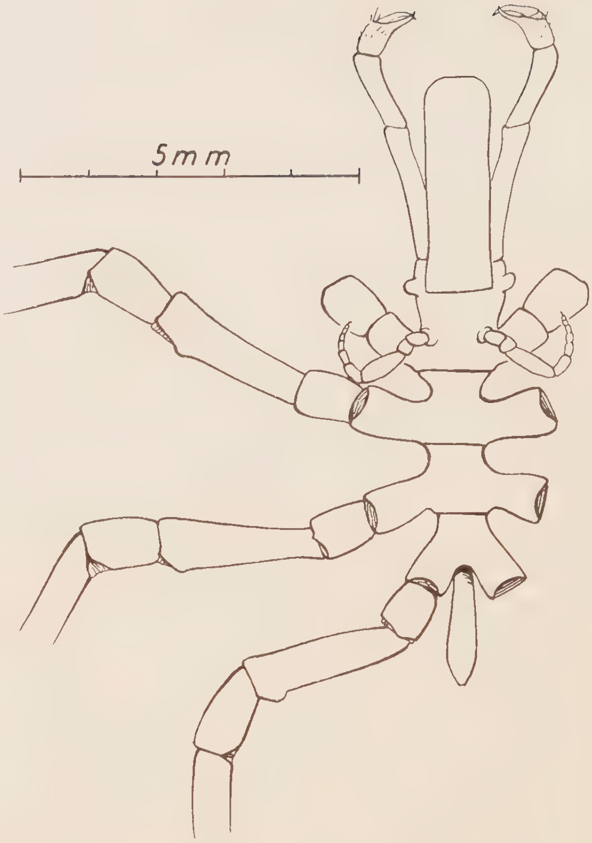


Fig. 5. *Pallenopsis mollissima* (Hoek) – Vue ventrale.

Corps entièrement lisse et glabre, tres nettement segmenté; prolongements latéraux soudés au tronc séparés environ de leur diamètre; tubercule oculaire bas et arrondi, situé sur le bord frontal et portant des yeux très faiblement pigmentés; abdomen assez long, un peu élargi vers l'arrière.

Trompe cylindrique, un peu plus courte que le corps.

Chélicères à scape divisé en deux articles, la proximal environ deux fois plus long que le distal; main globuleuse ornée de quelques soies; doigts à bord lisse sensiblement de même longueur que la main.

Palpes représentés par un très court bourgeon.

Ovigères, longueur 2,2 mm, à 10 articles, les trois premiers subégaux, leur ensemble aussi long que l'article 4 qui est plus robuste et plus long que le cinquième; les articles 6, 7 et 8 subégaux, les 9 et 10 plus petits; quelques soies spiniformes lisses sur les derniers articles, 3 à 4 soies sur l'article 10, l'une d'elle terminale simulant une griffe. Longueur 2,43 mm.

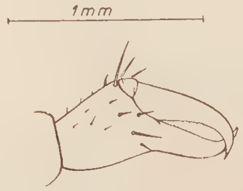


Fig. 6. *Pallenopsis mollissima* (Hoek) – Main de la chélicère.

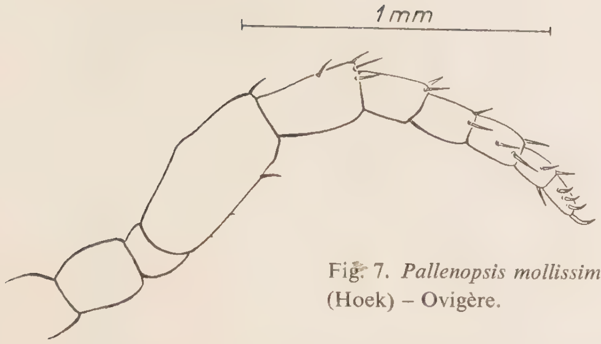


Fig. 7. *Pallenopsis mollissima* (Hoek) – Ovigère.

Pattes longues: presque 8 fois plus longues que le tronc: les coxas 2 plus longues que les coxas 1 + 3; fémur à peine plus long que le tibia 1, plus petit que le tibia 2; tarse faisant à peine le tiers du propode celui-ci armé de deux fortes épines proximales, suivies de 7 à 9 épines plus courtes mais de taille inégale; la griffe principale plus courte que le propode et flanquée de griffes auxiliaires faisant le cinquième de sa longueur.

Ni les orifices sexuels, ni les conduits des glandes cémentaires ne sont visibles.

Dimensions en millimètres

Troisième patte

Coxa 1...	1	femur....	7	tarse	0,5
– 2...	2,5	tibia 1...	6,5	propode	1,5
– 3...	1	– 2...	10	griffe	1
				griffes auxiliaires	0,2

Ovigère

art. 1 + 2 + 3...	0,7	art. 7...	0,18
– 4	0,65	– 8...	0,18
– 5	0,28	– 9...	0,12
– 6	0,2	– 10...	0,12

Il s'agit d'un exemplaire jeune qui, du bord frontal à l'extrémité de l'abdomen, mesure seulement 9 mm, mais qui, par son corps glabre, la forme des chélicères, la longueur des doigts de la pince, l'armature du propode, correspond au *Pallenopsis mollissima,* dont il ne se distingue que par la position terminale de l'épine distale du dernier article des palpes, simulant une griffe.

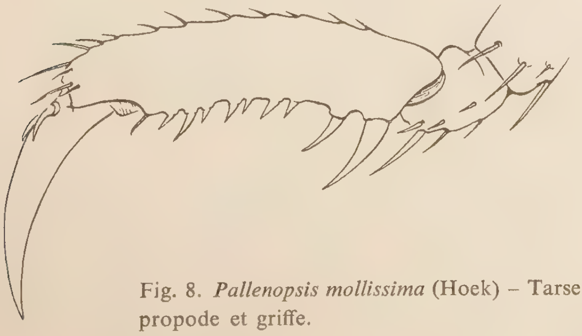


Fig. 8. *Pallenopsis mollissima* (Hoek) – Tarse, propode et griffe.

Le *Pallenopsis mollissima* a été pris par le "Challenger", au S de Yokohama à 3429 m (1875 fath) de profondeur; par l'"Albatross" en 1891 (SCHIMKEWITSCH 1893), dans le Pacifique tropical américain; par l'"Albatross" encore dans l'Insulinde (Stock 1953) par 4°35'S et 121°23'06"E, à 970 m. (525 fath.) de profondeur; c'est-à-dire au voisinage du point d'où provient l'exemplaire de la "Galathea": Stat. 491: 4°56'S et 117°39'E. Détroit de Macassar, prof. 1560 m.

AMMOTHEIDAE

Ammothella gigas, nov. sp.
(Fig. 9 à 14)

Mâle. – *Tronc* nettement segmenté; prolongements latéraux environ deux fois plus longs que larges, séparés par un intervalle au moins égal à leur diamètre; céphalon avec un cou très accusé, portant sur le bord frontal, orné de très longues soies, un long tubercule spiniforme dressé, sans trace d'yeux; abdomen dirigé horizontalement en arrière, grêle à la base, dilaté vers l'extrémité qui atteint le milieu des

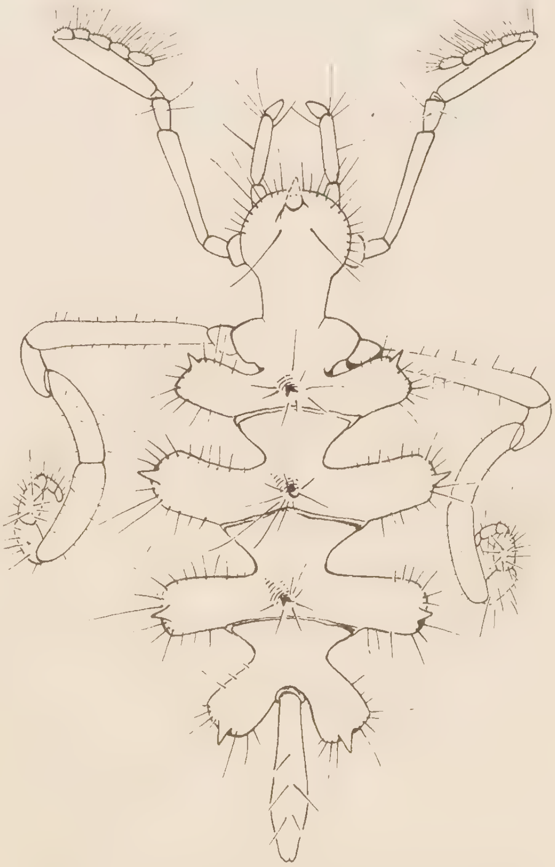


Fig. 9. *Ammothella gigas,* nov. sp. – Vue dorsale.

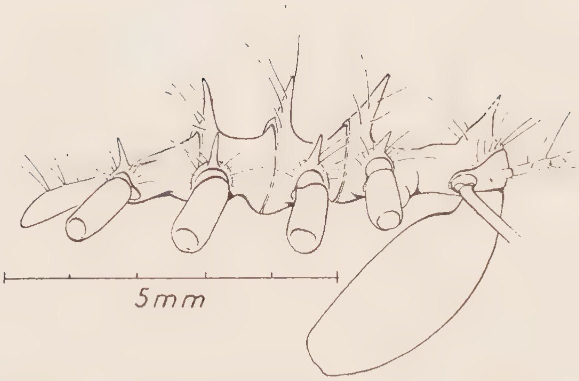


Fig. 10. *Ammothella gigas,* nov. sp. – Vue de profil.

coxas. 2. Les trois segments antérieurs du tronc ornés, chacun, d'une très forte épine médiane flanqué de très longues soies, et d'une épine semblable à peine moins haute, au bord distal des prolongements latéraux.

Trompe presque aussi longue que le tronc, dirigée ventralement en arrière, pédiculée à sa base.

Chélicères courtes et grèles; scape à 2 articles, le proximal de moitié plus court que le distal; pince piriforme acuminée au sommet, le doigt mobile à peine distinct comme une courte griffe; nombreuses et longues soies sur tous les articles.

Palpes à 9 articles, le deuxième de beaucoup le plus long; l'ensemble des cinq derniers aussi long que le sixième, subégaux et ornés de longues soies.

Ovigères à 10 articles; articles quatre et cinq courbes et subégaux; le sixième légèrement dilaté et un peu plus grand que le septième sur lequel s'articule latéralement le huitième; les trois articles distaux portant respectivement 2 – 1 – 2 épines spéciales denticulées; l'article 10 est très court et arrondi.

Pattes longues, tous les fémurs avec, à la base du tiers distal, le long tube de la glande cémentaire; nombreuses et longues soies sur les autres articles. Coxas 1 et 3 égales, leur ensemble de même longueur que la coxa 2; l'ensemble des trois coxas, le fémur, le tibia 1 et le tibia 2 de même longueur, un peu plus longs que l'ensemble du tarse et du propode; tarse très court avec quelques épines à la base; propode, incurvé, sa sole armée de 14-18 courtes épines; griffe égale aux deux tiers du propode; les griffes auxiliaires faisant un tiers de la principale.

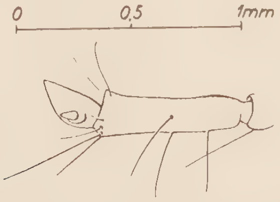


Fig. 11. *Ammothella gigas,* nov. sp. – Chélicère.

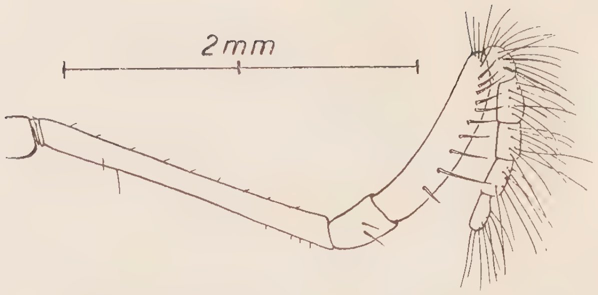


Fig. 12. *Ammothella gias,* nov. sp. – Palpe.

Pores sexuels sur toutes les deuxièmes coxas.

Dimensions en millimètres

Longueur du bord frontal à l'insertion de l'abdomen	5,5
Longuer de l'abdomen	2
Longueur du céphalon	2
Largeur du tronc au niveau des deuxièmes prolongements latéraux	3
Longueur de la trompe	3,8
Diamètre de la trompe	1,4
Hauteur du tubercule oculaire	1(?)

Chélicères		*Palpes*			
Scape 1...	0,3	art. 2...	1,7	art. 6...	0,5
– 2...	0,6	– 3...	0,3	– 7...	0,5
pince	0,35	– 4...	1	– 8...	0,5
		– 5...	0,5	– 9...	0,5

Ovigères

art. 1...	0,5	art. 6...	0,6
– 2...	1,7	– 7...	0,4
– 3...	0,7	– 8...	0,3
– 4...	1,1	– 9...	0,3
– 5...	1,1	– 10...	0,1

Troisième paire de pattes

Coxa 1...	0,7	fémur...	2,5	tarse	0,2
– 2...	1,4	tibia 1..	2,5	propode	2
– 3...	0,7	– 2..	2,5	griffe	1,2
				griffes auxiliaires	0,48

L'unique exemplaire de cette espèce est un mâle dragué par 1520 m de profondeur dans l'Océan Indien, au large du Kenia. Stat. 241: 4°00′S; 41°27′E.

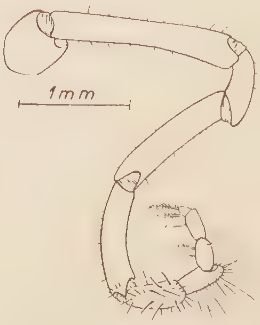


Fig. 13. *Ammothella gigas,* nov. sp. – Ovigère.

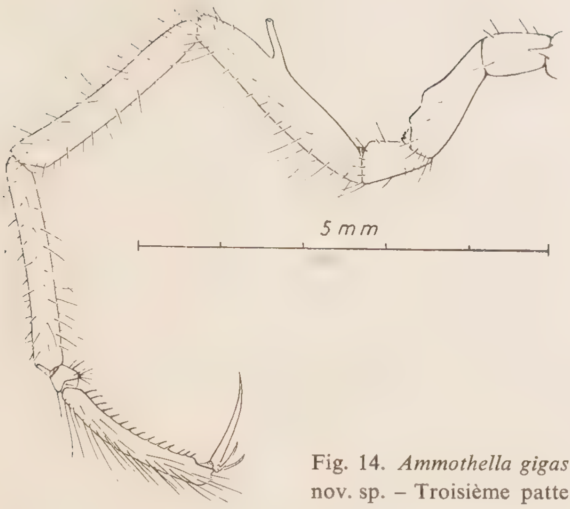


Fig. 14. *Ammothella gigas*, nov. sp. – Troisième patte.

Stock (1954) a donné une clef destinée à faciliter la détermination des espèces de ce genre; cette clef conduit, pour l'espèce ci-dessus à *A. setosa* Hilton, La description de Hilton (1942) en six lignes, sans aucune figure, est peu explicite et s'applique, au surplus, à des femelles prises sur le littoral de la côte de Californie, dont la longueur du corps est de 1,25 mm. L'*Ammothella gigas* atteint 5,5 mm et a été capturée, dans l'Océan Indien, par 1551 m de profondeur Il s'agit de la plus grande espèce du genre et, avec l'*A.profunda* Hedgpeth (1949) des mers du Japon, prise par 624 fath., la seule vivant en eau, profonde. Celle-ci, de petite taille (tronc = 1,75 mm) est comme l'*A.gigas,* aveugle et pourvue d'un long tubercule oculaire spiniforme; mais elle à les segments soudés, les prolongements latéraux très rapprochés, un céphalon court et sans cou.

Ascorhynchus glaber Hoek 1881

Je rapporte à cette espèce un individu jeune, mesurant 9.5 mm du bord frontal à l'extrémité de l'abdomen, et encore dépourvu d'orifices sexuels. Le tronc orné d'une rangée médiane de tubercules spiniformes élevés, les prolongements latéreaux lisses, le tubercule oculaire en forme de longue pointe dressée et dépourvu d'yeux, la trompe pointue à l'extrémité, le scape des chélicères à deux articles, la longueur des tarses (1,5 mm) et cette des griffes (0,75 mm) permettent d'être assez affirmatif sur cette détermination.

Notre exemplaire se distingue déjà de l'*Ascorhynchus japonicus* Ives (1891), espèce la plus voisine, par la structure de sa trompe et la hauteur de son tubercule oculaire.

Le type de l'*A. glaber* provient des parages de l'ile Crozet (46°46'S et 45°51'E) et a été dragué par 1375 fath. Il mesure 26 mm.

L'exemplaire de la "Galathea" a été pris dans l'Ocean Indien à une profondeur de 1520 m, à la station 241 (4°00'S; 41°27'E) au large du Kenya.

COLOSSENDEIDAE

LONGITARSES

Colossendeis angusta G.O.Sars 1877
(Fig. 15)

Six exemplaires de cette espèce ont été capturés par la "Galathea", dont un jeune de 15,5 mm portant encore des chélicères à 3 articles, bien que les orifices sexuels soient visibles sur les deuxièmes coxas de toutes les pattes.

Voici les dimensions, en millimètres de cet exemplaire, dragué à la station 661, par 5480 m de profondeur.

Longueur de la trompe	6,9
Diamètre de la trompe	1,00
Longueur du tronc	5
– du cephalon	2
– de l'abdomen	1,6

Palpe:				*Ovigère:*			
art. 2	3,2	art. 6	1,6	art. 4	6,1	art. 8	1
– 3	0,57	– 7	0,3	– 5	2,4	– 9	1
– 4	2,00	– 8	0,3	– 6	6,1	– 10	0,8
– 5	1,2	– 9	0,6	– 7	1,1	griffe	0,4

Troisième patte	
fémur	14
tibia 1	13,1
tibia 2	9,2
tarse	3,4
propode	3,4
griffe	3,4

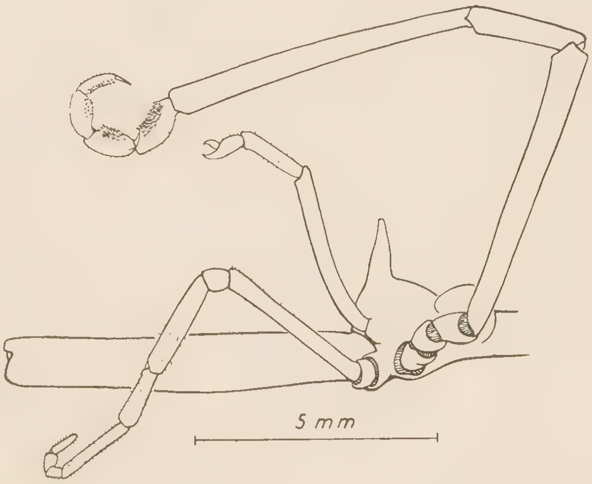


Fig. 15. *Colossendeis angusta* G. O. S. – Partie antérieure d'un jeune, porteur de chèlicères. Vue de profil.

On constate que chez ce jeune individu l'articulation du huitième article des palpes avec le septième est normale et se fait dans le même plan que celui-ci. On sait, en effet, et MEINERT (1899) a insisté sur le fait, que chez les adultes seulement le huitième article fait un angle assez prononcé avec le septième. Encore observe-t-on quelques variations à cet égard. Ainsi, sur les deux individus mâles capturés à la station 607, mesurant tous les deux 22 mm, chez l'un l'articulation est normale, chez l'autre l'article 8 est plus ou moins globuleux et rejeté sur le côté.

Cette espèce est largement répandue dans les profondeurs de tous les Océans. Dans les hautes latitudes, elle peut devenir littorale. STEPHENSEN (1913) la cite au Groënland par seulement 12 à 18 m.

Elle a été rapportée par la "Galathea" des stations suivantes:

Stat. 217. 14°20'S; 45°09'E (Canal de Mozambique) profondeur 3410 m, 1 ♂ de 22 mm;
Stat. 607. 44°18'S; 166°46'E (Mer de Tasmanie), profondeur 3580 m, 2 ♂ de 22 mm;
Stat. 661. 36°07'S; 178°62'W (fosse de Kermadec), profondeur 5340 m, 1 juv. de 15,5 mm;
Stat. 726. 5°45'N; 78°52'W (Golfe de Panama), profondeur 3670 m, 2 individus de 18,5 et 19 mm.

Colossendeis japonica Hoek, 1898

HEDGPETH (1949) a heureusement complété la description de HOEK (1898) en notant que les principaux caractères qui distinguent cette espèce sont la brièveté relative du deuxième article des palpes et de la griffe terminale des pattes.

Pour le plus grand des deux exemplaires de la "Galathea", dont le corps y compris l'abdomen, mesure 8,5 mm, la trompe fait 13 mm; le quatriéme article des palpes atteint 5 mm tandis que le deuxième n'a que 3,5 mm. Le tarse de la troisième patte mesure 3,5 mm, le propode 2 mm et la griffe 0,75 mm.

Sur aucun de ces exemplaires, dont cependant les ovigères font complètement développés, je n'ai pu découvrir les orifices sexuels.

Mais on distingue, de chaque côte à l'angle du bord frontal, une saillie qui semble marquer le point d'insertion des chélicères tombées à une mue précédente.

Cette espèce a été prise pendant l'Expédition du "Challenger" à la profondeur de 1875 fath. sur les côtes du Japon, au large du Cap King, 1 ♂ (?) type de l'espèce. Elle a été capturée, depuis, par l'"Albatross" à des profondeurs de 391 fath. (3 spécimens) et de 427 fath (1 spécimen) dans les mêmes parages, au S-W de Kyushu.

La "Galathea" a retrouvé deux exemplaires du *Colossendeis japonica* à la station 663, dans la fosse de Kermadec, par 4390 m de profondeur.

Colossendeis bruuni nov. sp.
(Fig. 16 et 17)

Mâle. – *Corps* entièrement lisse et glabre à segment soudés; céphalon court, plus large que long, portant un tubercule oculaire bas, conique terminé en courte pointe aiguë; pas d'yeux; prolongements latéraux, moins longs que la largeur du tronc et largement séparés de plus de leur diamètre; abdomen court, son extrémité atteignant le bord distal des premières coxas.

Trompe en massue plus courte que le tronc, relativement étroite à la base, à peine renflée au milieu et élargie à l'extrémité.

Cinquième article des *palpes* arrivant à l'apex de la trompe; article 2 le plus long; articles 6, 7 et 8 subégaux; l'article 9 sensiblement plus court; l'article 6 environ trois fois plus long que large.

Ovigères: les trois premiers articles courts et subégaux; les articles 4 et 6 de même longueur; article 5 faisant un peu plus du tiers de ce dernier; les quatre articles distaux subégaux, portent des épines spéciales, lisses, à pointe mousse, mélangées à d'autres plus courtes à bord apical oblique; ces dernières plus abondantes sur les articles 7 et 8; griffe

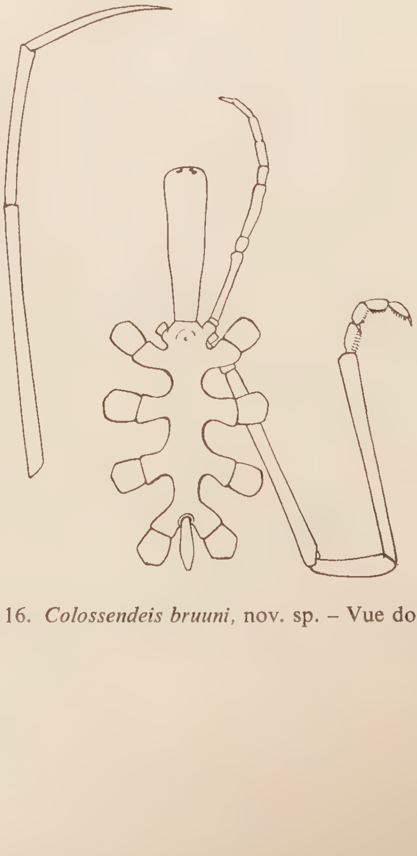


Fig. 16. *Colossendeis bruuni*, nov. sp. – Vue dorsale.

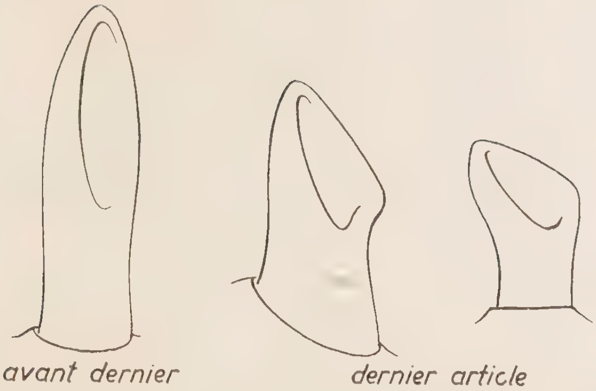


Fig. 17. *Colossendeis bruuni,* nov. sp. – Epines spéciales des ovigères.

robuste mais faisant au plus un quart de l'article précédent.

Pattes de la troisieème paire à coxas subégales et de même longueur que les prolongements latéraux; fémur à peine plus grand que le tibia 1 qui est sensiblement plus long que le tibia 2 et environ de même longueur que l'ensemble du tarse, du propode et de la griffe; tarse une fois et demie plus long que le propode qui est de même taille que la griffe.

Orifices sexuels à l'extrémité de toutes les deuxièmes coxas.

Dimensions en millimètres

Longueur de la trompe	7,5
Le plus grand diamètre de la trompe (au sommet)	2
Longueur du tronc	9
Largeur au niveau des prolongements latéraux	4,5
Longueur de l'abdomen	2,1

Troisième patte

Coxas	5	Tibia 2	17,5
Fémur	21	tarse	8
Tibia 1	20	propode	5,5
		griffe	5,5

Cette espèce appartient au même groupe que *C. glacialis* Hodgson et *C. drakei* Calman et se rapproche surtout de ce dernier dont il se distingue par ses prolongements latéraux plus largement séparés, le dernier article des palpes plus court, l'abdomen plus allongé, et les épines spéciales des ovigères à bord lisse, dont certaines obliquement tronqués à l'apex; en outre, il s'agit d'une espèce totalement aveugle.

Le *C. drakei* Calman (1915) est une espèce qui, dans les Mers du Sud (îles Falklands) et dans l'Antarctique, se tient par des fonds de 100 à 350 m.

Deux exemplaires mâles du *C. bruuni* ont été capturés à la Stat. 663 (36°31′S; 178°38′W) c'est-à-dire dans la fosse de Kermadec, à une profondeur de 4390 m.

Colossendeis michaelsarsi Olsen, 1913

Je partage en tous points l'avis de HEDGPETH (1948) qui met en synonymie de cette espèce le *C. arcuata* Milne-Edwards – (Bouvier 1937), dont la première description revient à OLSEN.

L'échantillon capturé par la "Galathea" dans l'Océan Indien (Stat. 283: 7°05′N; 79°37′E) par 840 à 920 m de profondeur, est un mâle pourvu de ses quatre paires d'orifices sexuels, qui correspond parfaitement à la description de OLSEN et que j'ai comparé à l'exemplaire du "Talisman".

Cette capture étend à l'Océan Indien la distribution géographique de cette espèce connue seulement jusqu'ici par les captures du "Talisman" du "Michael Sars" et de "l'Albatross" (1883) toutes les trois situées dans l'E. Atlantique entre le $28^{e\circ}$ et le $41^{e\circ}$ degré de lat. Nord, par 1365 à 1580 m de profondeur.

Colossendeis megalonyx Hoek, 1881
(Fig. 18 à 20)

Le *Colossendeis megalonyx* se caractérise essentiellement, parmi les espèces longitarses, par la longueur du 6e article des palpes (au moins 3 fois plus long que large), par le 7e article plus court que le 8e (moitié plus court), par la longueur du tronc inférieure à celle de la trompe qui est droite, pédiculée à la base, faiblement dilatée au milieu et à peine davantage à l'extrémité.

Un exemplaire capturé par la "Galathea" possède bien ces caractères; il possède aussi un tubercule oculaire élevé terminé en pointe aiguë, mais dépourvu d'yeux.

Je pense donc que nous pouvons identifier cet individu au *C. megalonyx.*

Mais il ressort des travaux de LOMAN (1923) et de GORDON (1932) que sous le nom de *megalonyx* HOEK (1881) a confondu plusieurs formes décrites plus tard sous les noms de *C. frigida* Hodgson et

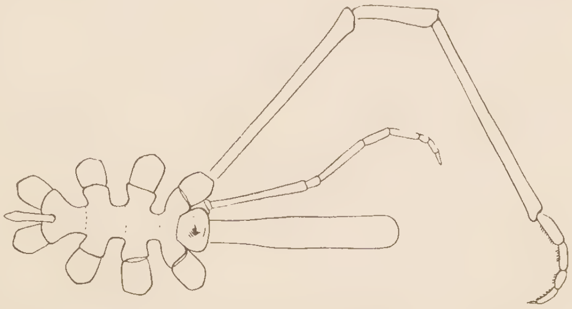


Fig. 18. *Colossendeis megalonyx* Hoek – Vue dorsale.

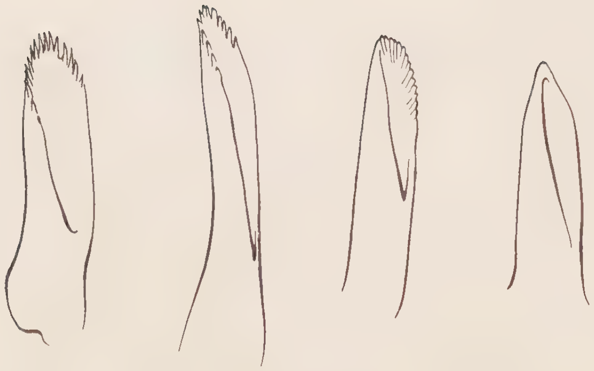


Fig. 19. *Colossendeis megalonyx* Hoek – Epines spéciales des ovigères.

Scoresbyi Gordon. Le fait que deux individus intermédiaires entre ces deux formes se trouvent dans les collections du "Challenger" incline à admettre que l'on a affaire à une seule espèce offrant une assez grande variabilité.

L'unique exemplaire de la *Galathea* est une ♀ dont voici les dimensions en millimètres:

Palpe

Trompe	18	art. 2 – 9	art. 6 – 4
tronc	12	– 4 – 6	– 7 – 1
		– 5 – 3,1	– 8 – 2
abdomen	2,7		– 9 – 2,2

Patte III

coxas	7	tibia 2	– 24
fémur	– 35	tarse	– 13
tibia	1–30	propode	– 8,5
		griffe	– 8,5

Cet exemplaire provient de la station 217, située dans le Canal de Mozambique: 14°20'S; 45°09'E. Il a été capturé à 3410 m de profondeur.

C. scoresbyi et *frigida* sont des formes subantarctiques, îles Falkland, Georgie du Sud et ont été capturés dans ces régions jusqu'à 549 m de profondeur. Les stations du "Challenger" se situent sur les côtes de Patagonie et dans les parages des Kerguelen par 70 à 120 fath.

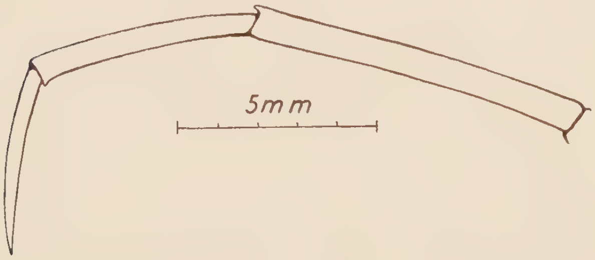


Fig. 20. *Colossendeis megalonyx* Hoek – Tarse, propode et griffe.

BREVITARSES

Colossendeis colossea Wilson, 1881

(Fig. 21, A)

Cette espèce, largement répandue dans les profondeurs de tous les Océans, a été capturée par la "Galathea" aux stations suivantes:

Stat. 668. 36°23'S; 177°41'E, fosse de Kermadec, profondeur 2640 m, 1 exemplaire, longueur du corps 37 mm.

Stat. 716. 09°23'N; 89°32'W, entre Acapulco et Panama, profondeur 3590 m, 1 exemplaire, longueur du corps 44 mm.

Stat. 724. 5°44'N; 79°20'W, Golfe de Panama, profondeur 3190 m, 1 exemplaire, longueur du corps 66 mm.

Dimensions en millimètres

Palpe

Trompe	22		art. 6 – 6,5
tronc	12	art. 2 – 12,5	– 7 – 2,5
abdomen	3	– 4 – 11	– 8 – 2,5
corps	37	– 5 – 3	– 9 – 2,5

Patte III		*Ou encore:*	
coxas	– 10	Trompe	39
fémur	56	tronc	23
tibia 1	– 58	abdomen	4
tibia 2	– 49	corps	66
tarse	7	Fémur	85
propode	4	tibia 1	80
griffe	1,5	tibia 2	70
long totale	195,5		

Colossendeis cucurbita Cole 1909

Colossendeis gigas-leptorhynchus Hoek 1881; **id.** Bouvier 1937

(Fig. 21, B)

La forme rapportée par le "Challenger", que Hoek 1881 considérait comme intermédiaire entre son *C. gigas (= colossea)* et son *C. leptorhynchus (= macerrima)* et qu'il a désigné sous le nom de *C. gigas-leptorhynchus,* est en réalité une excellente espèce, parfaitement décrite par Cole (1909) sous le nom de *C. cucurbita.* Calman (1923) avait soupçonné cette synonymie.

En fait, cette espèce, voisine de *C. colossea,* s'en distingue au premier coup d'oeil par les proportions fort différentes des articles des palpes. Si l'on compare, à ce point de vue, deux individus de memê taille: un *C. colossea* de 37 mm et un *C. cucurbita* de 39 mm, on constate que pour ce dernier les articles 2 et 4 des palpes sont dans la proportion de

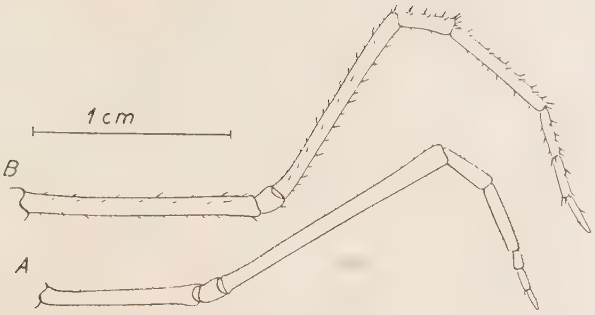


Fig. 21. Palpes. A. *Colossendeis colossea* Wilson; B, *Colossendeis cucurbita* Cole.

7 à 12 mm, tandis que pour *C. colossea* cette proportion est de 12,5 à 11 mm. De plus, dans le premier cas les trois articles distaux sont également allongés, subégaux et mesurent chacun 2,5 mm, alors que chez *C. cucurbita* l'antépénultième et le pénultième sont nettement plus courts que le terminal, dans la proportion de 0,71-0,75-1,5 mm. En outre, le fémur des pattes de *C. colossea* est plus court que le tibia I alors que celui de *C. cucurbita* est nettement plus long. D'ailleurs ce dernier a les pattes proportionnellement plus courtes que celles du *C. colossea.*

A ces différences très nettes, il faut ajouter la forme de la trompe bien figurée par Cole, longuement pédiculée à la base, élargie au milieu, plus faiblement rétrécie ensuite et, finalement, élargie au sommet; elle est légèrement incurvée vers le haut.

Il faut remarquer que tous ces caractères distinctifs sont déjà nettement apparents chez des individus mesurant seulement 14 mm de l'extrémité de la trompe à celle de l'abdomen.

Je pense que pour cette espèce, le nom de Cole doit être maintenu, ceux de *gigas* et de *leptorhynchus* étant tombés en synonymie.

Distribution Geographique. – L'exemplaire du "Challenger" a été capturé au Sud de l'Australie par 1800 fath.; ceux de Cole (3 individus) entre le Pérou et les îles Galapagos, profondeur 2005 fath.; ceux du "Talisman" dans les parages des Açores par 3975 et 4165 m.

Ceux de la "Galathea" proviennent de la Mer de Tasmanie, profondeur 4400 m, de la fosse de Kermadec à 2640 m et d'un dragage exécuté à 3590 m entre Alcopulco et Panama. Il s'agit d'une espèce probablement largement répandue dans les grands fonds de l'Atlantique et du Pacifique.

Localités:

Stat. 601. 45°51'S; 164°32'E, profondeur 4400 m: 1 exemplaire de 39 mm.

Stat. 668. 36°23'S; 177°41'E, profondeur 2640 m: 4 exemplaires de 18-28 et 30 mm.

Stat. 716. 09°23'N; 89°32'W, profondeur 3590 m: 2 exemplaires de 14 mm, 1 exemplaire de 45 mm et 1 exemplaire de 52 mm.

Aux stations 668 et 716, cette espèce a été capturée en même temps que le *C. colossea.*

Dimensions en millimètres

		Palpe		*Ovigère*	*Patte I*	
Trompe	30	Long. totale 39	art. 6 – 4	long. totale 70	coxas – 8	tarse 6,5
tronc	17	art. 2 – 9	– 7 – 0,75	art. 4 – 26	fémur 54	propode 3
abdomen	5	– 4 – 15,5	– 8 – 1	– 6 – 29	tibia 1 – 52	griffe 1
corps	52	– 5 – 3	– 9 – 1,5		tibia 2 – 32	
					long. totale 156,5	

		Palpe		*Ovigère*	*Patte III*	
Trompe	25	Long. totale 35	art. 6 – 4	long. totale 60	coxas – 7	tarse 6
tronc	15	art. 2 – 8,5	– 7 – 0,75	art. 4 – 22	fémur – 48	propode 3
abdomen	4	– 4 – 14	– 8 – 1	– 6 – 25	tibia 1 – 47	griffe 1
corps	44	– 5 – 2,5	– 9 – 1,5		tibia 2 – 30	
					long. totale 142	

		Palpe		*Patte III*	
Trompe	22	art. 2 – 7	art. 6 – 3,5	coxas – 7	tarse 5
tronc	14	– 4 – 12	– 7 – 0,71	fémur – 43	propode 3
abdomen	4	– 5 – 2,5	– 8 – 0,75	tibia 1 – 39	griffe 1
corps	39		– 9 – 1,5	tibia 2 – 26	
				long. totale 117	

2 individus: longueur du corps 14 mm. – trompe 8 mm – palpe: art. 2 = 3; art. 4 = 5.

Colossendeis macerrima Wilson, 1881

Dix neuf exemplaires de cette espèce répandue dans tous les Océans ont été capturés par la “Galathea”. Parmi eux se trouvent sept jeunes dont la longueur du corps s’échelonne entre 13 et 18 mm. Même ces derniers ne portent aucune trace de la présence des chélicères. Celles-ci, dans cette espèce, doivent donc disparaitre très tôt.

Les captures ont été faites à trois stations différentes:

Stat. 217. 14°20′S; 45°09′E (Canal de Mozambique), prof. 3410 m 3 exemplaires de 19, 22 et 27 mm.
Stat. 716. 09°23′N; 89°32′W (S du Golfe de Panama) prof. 3590 m, 7 exemplaires jeunes de 13, 15,5, 16, 17 et 18 mm et 8 adultes de 22 à 32 mm.
Stat. 726. 5°45′N; 78°52′W (Golfe de Panama), prof. 3670 m, 1 exemplaire de 30 mm.

La plus grande profondeur à laquelle cette espèce était jusque là connue était de 3186 m, dans le S.-Atlantique (48°6′S et 10°5′W). Bien que les captures de la “Galathea” étendent en profondeur la distribution de cette espèce, il faut noter que celle-ci est assez eurybathe puisque, sans parler des captures douteuses signalées en Afrique du S par 79 m et en Islande par 139 m, elle a été remontée en Indo-Malaisie de fonds voisins de 500 m.

Ainsi que l’indique P. P. C. Hoek (1881) pour son *C. leptorhynchus* (= *macerrima* Wilson), chez cette espèce, les orifices sexuels ne se trouvent qu’aux deux dernières paires de pattes.

Colossendeis sp. ?
(Fig. 22)

Corps entièrement lisse et glabre à segments soudés. Cephalon court, sa largeur égale à la largeur du bord frontal, portant un tubercule oculaire bas, transverse, pourvu de chaque côté d’une faible saillie arrondie au sommet. Pas d’yeux. Prolongements latéraux un peu plus longs que la largeur du tronc, séparés par un intervalle inférieur à leur diamètre; abdomen horizontal cylindrique, son extrémité dépassant le bord distal des premières coxas.

Trompe plus longue que le corps, très légèrement infléchie vers la face ventrale, cylindrique, plus étroite vers le tiers terminal, élargie à son sommet.

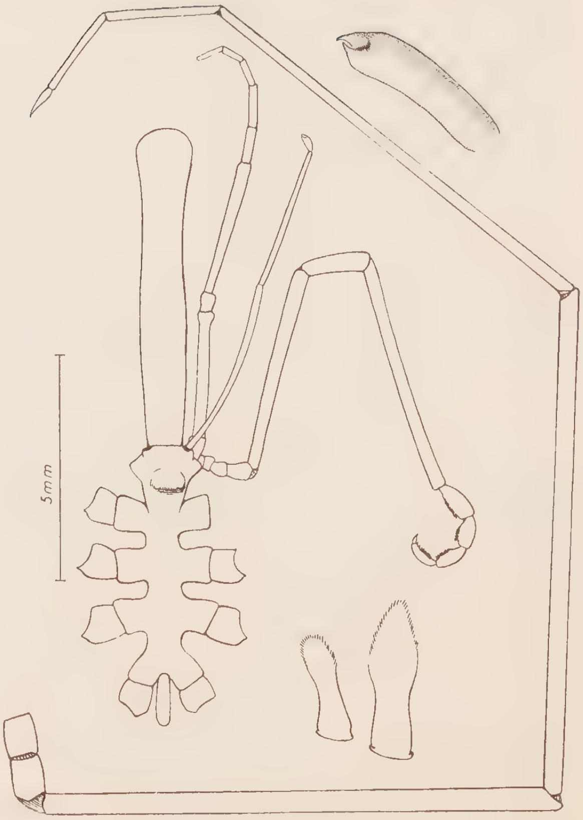


Fig. 22. *Colossendeis* sp. – Vue dorsale; Main des chélicères; épines spéciales de l’ovigere.

Chélicères très grèles, de même longueur que la trompe, à scape de deux articles, le proximal aussi long que l’ensemble de l’article distal et de la pince. Celle-ci 4 fois plus longue que large; sa longueur égale à $^{1}/_{8}$ de la longueur de l’article distal du scape, terminée par un doigt court et lisse.

Palpes dépassant largement l’extrémité de la trompe; l’article 4 à peine plus long que l’article 2 et à peine plus court que l’ensemble des cinq articles suivants; articles 7, 8 et 9 cylindriques et trois fois et demie plus longs que larges, subégaux chacun d’eux un peu plus court que le 6e. Soies assez nombreuses, courtes et raides sur les cinq derniers articles.

Ovigères avec l’article 6 le plus long et de même longueur que le tronc; article 7 et suivants portant de nombreuses épines spéciales à bord finement denticulé. Griffe unguiforme, épaisse et courte.

Pattes ornées de quelques soies courtes et raides; celles de la troisième paire plus de 3 fois plus longues que le corps, leur fémur de même longueur que le tibia I, sensiblement plus long que le tibia II; tarse un peu plus long que le propode, égal à $^{1}/_{4}$ du tibia II; griffe très courte égale à $^{1}/_{3}$ du propode.

Orifices sexuels indistincts.

Dimensions en millimètres

Longueur de la trompe	7
Son plus grand diamètre (au sommet)	1,2
Longueur du tronc	5
Largeur au niveau des prolongements latéraux	0,73
Longueur de l'abdomen	1

Chélicères				*Palpes*	
art. 1...	4	art. 2...	2,8	art. 6...	0,93
– 2...	3,1	– 3...	0,4	– 7...	0,60
		– 4...	3,0	– 8...	0,46
pince...	0,40	– 5...	0,8	– 9...	0,66

Patte III

coxas...	2,8	tibia II...	10
fémur...	11	tarse......	2,4
tibia I...	11	propode...	2
		griffe.....	0,73

Stat. – n° 726. Lat. 5°45′N; Longit. 78°52′W (Golfe de Panama), profondeur: 3670 m.

Affinités. – Cet individu, encore immature, est difficile à identifier. Brevitarse, il appartient au groupe du *C. colossea* Wilson; mais il se distingue nettement de cette espèce de grande taille, notamment par la forme cylindrique et la longueur moindre de sa trompe. On ne saurait l'assimiler au *C. minuta* Hoeck ou au *C. subminuta* Schimkewitch dont les descriptions incomplètes laissent d'ailleurs des doutes sur leurs affinités avec le *C. colossea.*

Le *C. subminuta* ne semble connu que par l'échantillon jeune, endommagé, de 10,5 mm de longueur totale, recueilli par l'*Albatross* (1891) vers le S. E. de l'île Coccos par 2149 m de profondeur. D'après la description qu'en donne Schimkewitch (1893), les proportions du corps et celles relatives des appendices sont assez conformes à celles de l'exemplaire de la "Galathea"; toutefois le deuxième article des palpes serait deux fois plus long que le quatrième et, faute de figure, nous sommes peu renseignés sur la forme du céphalon qui porte un tubercule oculaire surmonté d'une épine.

Le *C. minuta* Hoek a été également décrit sur un unique exemplaire dragué par le "Challenger" à deux degrés environ au S. de Halifax, à peu près à la même profondeur (1250 fath). La longueur totale du corps est de 8 mm et Hoek (1881) ne sait s'il s'agit d'un adulte. Par sa trompe cylindrique et les proportions relatives des articles des palpes, cet individu rappelle celui que nous étudions; mais il a les pattes proportionnellement beaucoup plus longues (environ 4 fois la longueur du corps) et leur griffe égale en longueur à la moitié du propode.

Hedgpeth 1948 a cru pouvoir identifier à cette espèce 4 individus capturés par l'Albatross (1883-86) au N. du cap Hatteras et 1 individu dragué par l'Atlantis (1939) dans les mêmes parages. Ces individus ne diffèrent du *C. colossea* que par leur taille moindre; il pense qu'il s'agirait seulement d'une variété naine de ce dernier.

En présence d'une systématique aussi peu précise et dans l'ignorance où nous sommes des modifications qui interviennent au cours de la croissance, nous pensons qu'il est préférable de ne pas qualifier d'un nom nouveau le jeune exemplaire capturé à bord de la "Galathea". Celui-ci est d'ailleurs fort intéressant en raison du fait qu'au stade considéré (13 mm) il a conservé ses chélicères.

Remarques sur la Présence des Chélicéres. – Il est remarquable qu'aucune espèce de *Colossendeis* n'a été capturée avec ses oeufs. Nous ignorons donc comment est constitué l'embryon et quelles modifications subissent au cours de leur développement les stades larvaires et post-larvaires.

Cependant, d'une part, I. Gordon (1932) a constaté qu'une larve de 7 mm de longueur du *C. scoresbyi* Gordon possédait des chélicères à scape de deux articles, et, d'autre part, Meinert (1899), qui a pu examiner une larve de *C. angusta* G. O. Sars longue seulement de 6 mm, en décrit et en figure les chélicères. Il retrouve les même appendices sur des jeunes de 13 et 14 mm.

C'est aussi chez la même espèce que Hoek, d'abord en 1881 *(C. gracilis* Hoek = *C. angusta* G. O. S.), puis en 1882 *(C. angusta* G. O. S.) signale la présence de chélicères sur des individus de 9 à 12 mm de longueur, donc très voisins de la taille adulte.

Sur un exemplaire des collections du Muséum de Paris, provenant de la côte Mourmane, et long de 12 mm les chélicères sont également présentes. Elles le sont encore, ainsi qu' on l'a vu (fig. 15) chez un exemplaire de la même espèce capturé par la "Galathea", mesurant déjà 15 mm et pourvu de ses orifices sexuels.

Il semble donc qu'au moins pour cette espèce ces appendices demeurent fréquemment en place jusqu'à la mue imaginale, et Meinert (1899) puis Calman et Gordon (1933) ont eu raison, tenant compte de cette constation, de modifier la diagnose de la famille des *Colossendeidae,* à laquelle se trouvent d'ailleurs incorporés les *Decolopoda* et *Dodecolopoda* normalement pourvus de chélicères.

Les chélicères de ces espèces sont assez robustes, leur scape est formé de deux articles dont le proximal est beaucoup plus long que le distal et leur pince est plus ou moins globuleuse. Dans l'exemplaire de la "Galathea" étudié ici, les chélicères sont beaucoup plus grèles et la pince, à peine un peu plus dilatée que le scape, est 4 fois plus longue que large et se termine par un crochet rudimentaire. Il ne paraît pas douteux que ces appendices doivent disparaitre lors de la mue dont sort l'adulte.

Je ne crois pas que la présence de chélicères aient été signalée chez d'autres espèces de *Colossendeis.* Mais on a observé parfois, de chaque côté du cephalon, une petite proéminence qui pourrait être un bourgeon cicatriciel des appendices disparus. SCHIMKEWITCH (1893) interprête ainsi de telles formations observées chez. *C.macerrima* Wilson et *C.subminuta.*

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POGONOPHORA

FIRST RECORDS FROM THE EASTERN PACIFIC

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Introduction

Since the printing of my first report of *Pogonophora* (KIRKEGAARD 1956) was finished some new specimens of this interesting class were found in material from the Galathea Expedition.

Dr. P. L. Kramp, who works out the hydroids, found among some *Stephanoscyphus* two tubes which did not belong to his material. At the first glance I thought that they were tubes of *Pogonophora,* and a closer examination showed in one of the tubes some small and damaged fragments of the animal, sufficient to prove that they were really *Pogonophora*-tubes.

The most interesting thing about this find was the geographical position. The tubes were from St. 724 in the Gulf of Panama, an area far from earlier finds of *Pogonophora.* By examining the material of polychætes from the Gulf of Panama I found still another tube from the same station. This tube was different from the others and contained an almost complete specimen which I am confident must be identical with *Lamellisabella zachsi* USCHAKOV.

I hope the story of these finds will induce some keepers of material from Deep Sea Expeditions to make a closer examination of unidentified tubes. I am sure that more material of this group can be found in such old material.

As in the earlier report the figures were made by Poul H. Winther and the English text corrected by Mrs. Agnete Volsøe to both of whom I express my best thanks.

Description of the material

FAM. LAMELLISABELLIDÆ IVANOV 1951

Pogonophora with fused tentacles forming a hollow cylinder.

LAMELLISABELLA ZACHSI USCHAKOV 1933

(Figs. 1 and 2 a-c)

Material:

Gulf of Panama: St. 724. 5°44'N 79°20'W. 2950-3190 m. 1 specimen, almost complete, only the posterior part of the trunk absent. 90 × 1 mm. 1 tube: 150 × 1$^1/_2$ mm.

The tentacles are fused by a thin lamella forming a hollow cylinder. Since a part of this cylinder is lost, it is impossible to count the number of tentacles. JOHANSSON (1940) indicates 29. The length of the tentacle-crown is 12 mm. The anterior section of the body is very short, the cephalic lobe is damaged, but the bridle is very distinct, black, fused ventrally, but the two parts do not meet dorsally. Ventrally, on the anterior part of the trunk, horseshoe-shaped chitinized platelets are situated. These platelets (Fig. 2a) are very characteristic and quite similar to those described and figured by USCHAKOV (1933). They are placed on the border of the ventral groove, in my specimen in a number of 15 on each side. USCHAKOV describes 17-22 on each side, maybe some have fallen off in my specimen. In the posterior part of this section some of the horseshoe-shaped platelets are replaced by very tiny platelets of another shape (Fig. 2b). Posteriorly only these tiny platelets are present, situated in the adhesive papillæ. At the middle of the trunk are two belts, they consist of rows of small chitinoid platelets the surface of which is covered with four rows of denticles (Fig. 2c). The belts are parallel to each other, interrupted on the ventral surface. The preannular

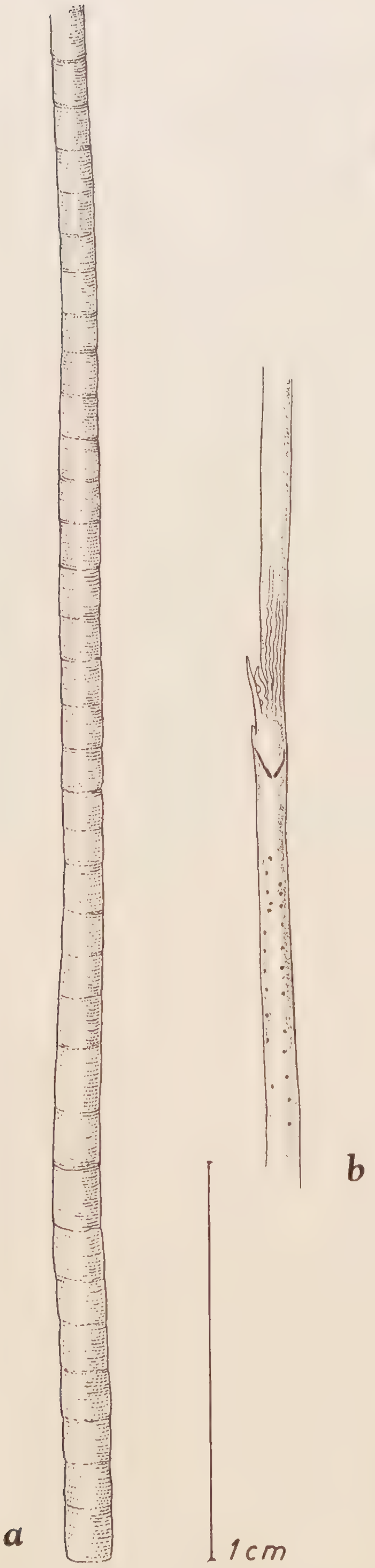

Fig. 1. *Lamellisabella zachsi* Uschakov. a. Tube. b. Ventral view of anterior part with a piece of the tentacle-crown.

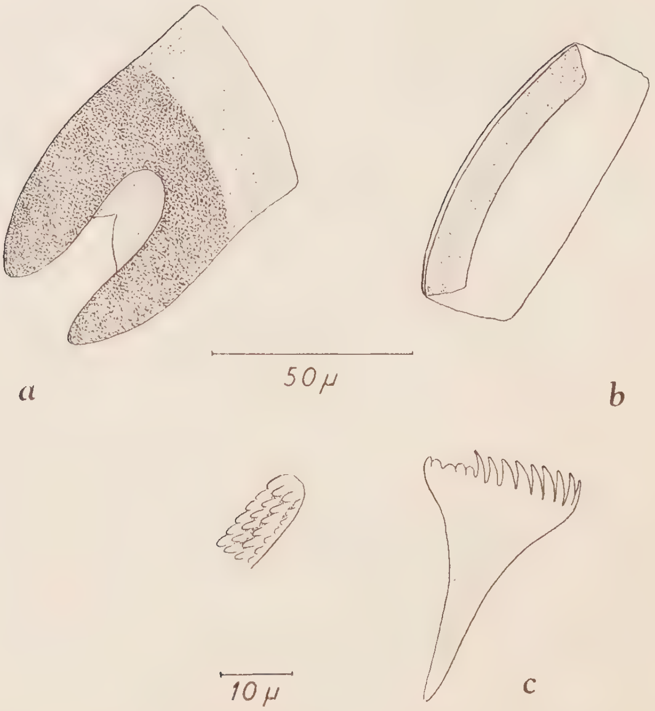

Fig. 2. *Lamellisabella zachsi* Uschakov. a. Horseshoe-shaped platelet from the anterior part of the trunk. b. Normal platelet from the posterior part of the trunk. c. Dentated platelets from the belt.

section of the trunk is 70 mm long and has a diameter of 1 mm.

The tube is strongly chitinized, without collars, but faintly segmented (Fig. 1). The colour is brown, light brown and translucent in the upper part and darker in the lower part. It is 150 mm long with a maximum diameter of $1^1/_2$ mm, but possibly a part of it has broken off and is lost.

Uschakov's description of this species is not quite sufficient. He has no figure of the tube and no measurements on the figures of the platelets. The characters of the present specimen are however so similar to Uscakov's description that I refer it to his species, although the finding place is so far from the first one.

Distribution: Sea of Okhotsk, Behring Sea, Gulf of Panama. 2950-3500 m.

? FAM. POLYBRACHIIDÆ Ivanov 1952

Pogonophora with numerous free tentacles arranged in a circle or on a horseshoe-shaped base.

Krampolinum n. gen.

Small tubes consisting of a lower unsegmented part, a middle part with low collars and an upper translucent part with broad collars.

The genus is named after the known specialist on coelenterates P. L. Kramp, Dr. phil., who found the material.

Krampolinum galatheae n. sp.
(Fig. 3)

Material:

Gulf of Panama: St. 724. 5°44′N 79°20′W. 2950-3190 m. One fragment of a damaged specimen. 2 tubes. 1. 30 × 1 mm, lower part absent. 2. 66 × 1 mm. (Type preserved in the Zoological Museum of the University, Copenhagen).

As only the anterior section with a few tentacles are present and this fragment is very damaged it is of course not possible to give a closer description.

The fragment consists of the anterior section of the body. In front of this there is a cone-shaped cephalic lobe, somewhat damaged, and some free tentacles. In the tube are many free tentacles, but it is impossible to count them. At the middle of the fragment is a very distinct bridle consisting of a pair of oblique cuticular ribs which converge ventrally and dorsally, but they are not fused.

The most complete tube (Fig. 3) consists of a lower part, black coloured with transverse yellow lines and without collars, a middle part also black coloured with low collars and an upper light brown translucent part with very broad collars.

Although only very poor material is present I dare give it a name because the tubes are so characteristic. I think Ivanov is right in his opinion that the details of the structure of the tubes may be used for the characterization of the different forms.

Distribution: Gulf of Panama. 2950-3190 m.

Zoogeographical Remarks
(Fig. 4).

These new finds of *Pogonophora* from the Gulf of Panama indicate a much more extended distribution than hitherto expected. Until now *Pogonophora* were known only from the north western Pacific and the Malayan Archipelago, i. e. from the western part of the Pacific. The present find at a single station of the "Galathea" in the eastern part of the Pacific indicates that the group is distributed in abyssal regions of the total Pacific. As I wrote in my first report (Kirkegaard 1956) it seems reasonable that the *Pogonophora* are restricted to areas with a great supply of organic matter. The new finds support this theory since the Gulf of Panama is known as an area with a very high organic productivity.

Fig. 4 gives a picture of our present knowledge of the distribution of *Pogonophora*. It is seen from the chart that most of the species are known from one area only, but two species, *Polybrachia annulata* and *Lamellisabella zachsi*, seem to have a wider distribution. *Polybrachia annulata* is known from the Sea of Okhotsk and the Behring Sea and *Lamellisabella zachsi* from the Sea of Okhotsk, Behring Sea and the Gulf of Panama. Possibly the class *Pogonophora* consists of a group of species with a wide distribution and a group with a more restricted one, but I think it more probable that further investigations may show a more extended distribution of the known species.

The present specimen of *Lamellisabella zachsi* contained some bottom material in the top of the tentacle-cylinder. Do the *Pogonophora* live as deposit-feeders and not as suspension-feeders as indicated by Ivanov? To me the tentacle-cylinder seems to be a very poor filtration organ. Possibly the bridle serves as a support on the edge of the tube when the animal protrudes the tentacle-cylinder to search the bottom.

The story of the finding of these two species make it more probable to get further material from other parts of the world. At least in the Pacific we should expect to find *Pogonophora* along the western coast of North and South America including the trenches. Also the western coast of Australia is an area with a high productivity

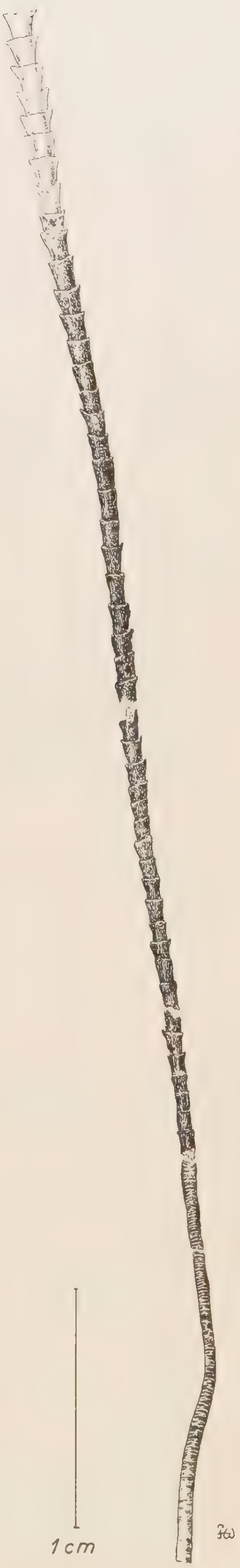

Fig. 3. Tube of *Krampolinum galatheae* n. gen. n. sp.

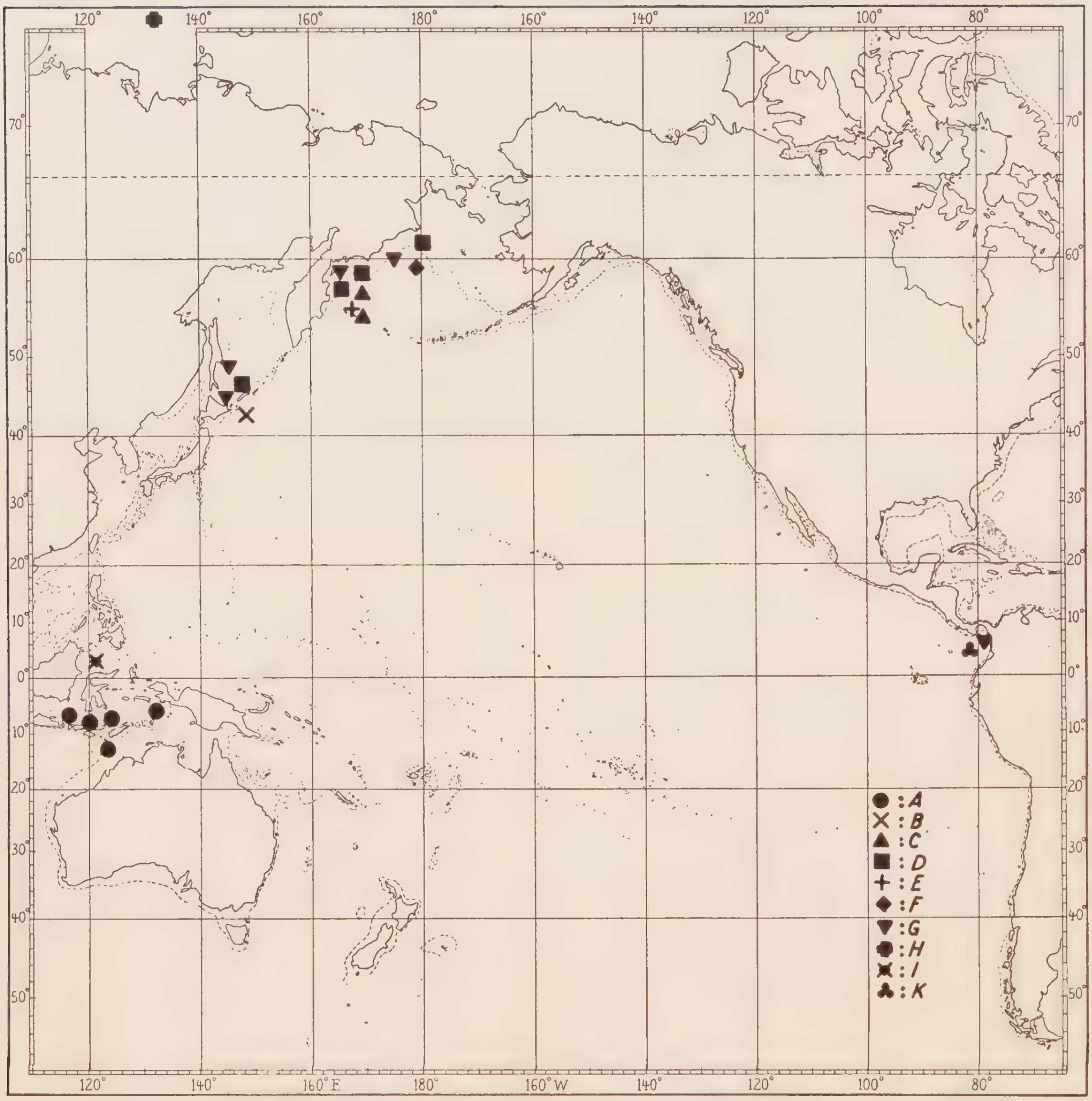

Fig. 4. Distribution of described species of Pogonophora. A. *Siboglinum weberi.* B. *Heptabrachia abyssicola.* C. *Birsteinia barbata.* D. *Polybrachia annulata.* E. *Polybrachia barbata.* F. *Spirobrachia grandis.* G. *Lamellisabella zachsi.* H. *Lamellisabella gorbunovi.* I. *Galathealinum bruuni.* K. *Krampolinum galatheae.*

of organic matter. If there are *Pogonophora* in the Atlantic I suppose, according to my theory, that we must find them on the north-west and south-west coast of Africa, off New Foundland, Iceland and the north-western coast of Norway. All these areas are known as places with a great supply of organic matter.[1]

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[1] In a recent paper JÄGERSTEN described a new species of *Siboglinum* from 487-650 m in the Skagerrak (cf. JÄGERSTEN, G., 1956: Investigations on *Siboglinum ekmani*, n. sp., encountered in Skagerak. – Zool. Bidrag från Uppsala, 31, pp. 211-252).

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CRUSTACEA TANAIDACEA
FROM DEPTHS EXCEEDING 6000 METERS

By TORBEN WOLFF
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A. INTRODUCTION

During the Galathea Expedition 1950-52 three species of Tanaidacea were collected at depths greater than 6000 m; this corresponds rather well to the number of species of Isopoda (twelve) and of Amphipoda (thirteen) from similar depths, when the restricted total number of tanaid species is taken into account. However, no species was recorded from the greatest depths (about 10.000 m) in the Philippine Trench, from where one species of isopods and one of amphipods was collected.

All three species are of a considerable size, in fact amongst the very largest ever recorded. There is, however, no reason to suggest that small or even microscopic species may have escaped our attention. In all deep-sea hauls on the Galathea HANSEN's (1913, p. 3) method of collecting, as used on the Ingolf Expedition, was practised, and all tanaids, even very small specimens, would certainly have been retained during the painstaking sifting of the bottom material in the bucket at the cod end of the trawl.

Till now the deepest recorded species of Tanaidacea were taken by the Siboga Expedition *(Apseudes sibogae* and *weberi,* 4391 m) and the Challenger Expedition *(Typhlotanais brachyurus* and *kerguelenensis,* and *Bathytanais bathybrotes,* 3750 m). In order to include the records in the present paper I have recently described six new abyssal species of *Neotanais,* collected by the Galathea, one of which *(N. robustus)* was found between depths of 4390 and 4570 m (WOLFF 1956 b). So far no records of tanaids from the Russian deep-sea expedition to the Kurile-Kamtchatka Trench have – as far as I know – been published.

As in my report on the Isopoda (1956 a) I have studied a number of related species, mainly kept in this Museum. In some cases I found it necessary to include a redescription of such species. Unfortunately, some rather doubtful species only exist in one specimen, the type, and could therefore not be borrowed and examined.

The bottom-temperatures at the Galathea Stations are according to Bruun & Kiilerich (1955). In those cases where the Expedition did not obtain records of bottom-temperature from exactly the depth at which the tanaids were dredged, the average figures and graphically interpolated figures in the above paper have been used. The salinity was constantly found to be 34.7 ‰ ± 0.2 ‰. The Hydrographic Department of the Danish Fisheries Investigations (Charlottenlund Slot) has kindly supplied me with records of bottom temperatures, not otherwise obtainable.

With Professor K. Lang, Stockholm, I have discussed several taxonomic questions; for help and advice I wish to express my gratitude. Also to Dr. A. F. Bruun, the Leader of the Galathea Expedition, my thanks are due for valuable discussions on deep-sea problems.

Fig. 21 was drawn by the artist Poul H. Winther, all the remaining illustrations by the author. Where nothing else is stated in the legends of the figures the drawings are based on the type specimen. Mrs. Agnete Volsøe has kindly revised the English text.

The type specimens are kept in the Zoological Museum of the University, Copenhagen.

B. TERMINOLOGY

The terminology of the external morphology of Tanaidacea was recently considered by Lang (1953a). Since I find it very essential as soon as possible to reach a final decision regarding the appellation of the various body segments, appendages, etc. within related groups, I shall also put forward some suggestions. They aim at obtaining a still greater simplicity in the repeated naming of these features of systematic value. The suggestions and the amendments to Lang's proposals have been considered by Dr. I. Gordon and Professor K. Lang, both of whom I thank for valuable help.

1. One of the major difficulties is the terminology of the thoracic segments and their corresponding appendages. As is well known, in all Malacostraca the head is followed by eight thoracic segments, of which the first is always coalesced with the head. The remaining seven may be all free or all coalesced with the head (and the first segment) or some may be free and some coalesced.

In the Peracarida, the Amphipoda and the Isopoda have the first (and very rarely the second) thoracic segment coalesced with the head, while in the Tanaidacea the first and the second segments are constantly coalesced with the head. This difference in coalescence both in these three orders and in other Malacostracan groups is the main reason for the confusion.

If the terms "thorax" and "thoracic" are used the only correct appellation would be "the first, second, third . . . eighth thoracic segment (or somite)" or "thoracic segment (or somite) 1, 2, 3 . . . 8". Since, however, the first segment (with the maxillipeds) is always fused with the head in Isopoda and Amphipoda, almost all authors tacitly consider the seven succeeding, free, thoracic segments as equivalent with the total thorax and name the first free segment: "segment (somite) 1", etc. In Tanaidacea, with two coalesced segments, the descriptions are almost always encumbered with the long and circumlocutory terms "first free thoracic segment (somite)", etc., which is of course necessary when confusion is to be avoided.

But why not use instead the term peraeon[1]? This word was first introduced by Spence Bate who in his treatise on Amphipoda (1856, p. 27) wrote: "*Thoracic segments* (Pereion). The seven annules which posteriorly follow the cephalic portion . . ." Originally pereion (or peraeon) is thus equivalent with the last seven thoracic segments (2-8). In Isopoda and Tanaidacea the numbering of the corresponding legs is generally in accordance with this terminology, peraeopod 2 being for instance the leg of the second peraeon segment. In Decapoda and Amphipoda, however, there are only five pairs of peraeopods which in Decapoda follow maxillipeds 1-3 and in Amphipoda maxilliped and gnathopods 1-2. Almost all authors use peraeopods (or pereiopods) 1-5 (or I-V) in these two groups – except for instance Chevreux & Fage (Amphipodes, 1925, Faune de France) who use gnathopods 1-2 followed by pereiopods 3-7.

It is therefore not quite correct when Lang (l.c., p. 341) writes: "Strictly speaking, the maxillipeds

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[1] The spelling of the word will be discussed below.

are the first pair of legs, and the following pair of legs is the second pair of peraeopods.” Actually, they are the *second* pair of thoracic legs but the *first* pair of peraeopods. This is also according to the definition of “Peraiopoden (Pereiopoden)”, given by Zimmer in Handbuch der Zoologie (1927, p. 303): “Thorakelfüsse, die der Lokomotion dienen, im Gegensatz zu den Maxillipeden”. On the other hand, Zimmer’s statement “Peraion (Pereion) = Thorax” is not correct. Peraeon is equivalent only with thoracic segments 2-8.

The peraeon segments should thus be numbered 1-7. But instead of using in descriptions over and over again the term “the first peraeon segment” or “peraeon segment 1” I suggest to call the single segments “peraeonite 1, peraeonite 2”, etc., corresponding to the terminology and numbering of the peraeopods in Isopoda and Tanaidacea.

2. Likewise the pleon segments may be called “pleonites”. In Tanaidacea we consequently find pleonites 1-5, followed by the pleotelson (where reduction has not taken place).

3. Of course it is also more simple to distinguish the peraeopods by means of their different cipher (number). In order to avoid confusion I suggest to give their cipher in Roman letters. This has been used for a considerable time by many carcinologists working on Decapoda. In Isopoda it was introduced recently by Bocquet & Levi (1955) and was also used by me (Wolff 1956a). Thus, in Isopoda there are peraeopods I-VII and in Tanaidacea chelipeds (= peraeopods I) and peraeopods II-VII.

I am fully aware of the regrettable fact that in Decapoda, Cumacea and Amphipoda peraeopods I-V (or 1-5) will correspond to peraeopods III-VII in Isopoda and Tanaidacea. I do not think there is much to do about this. It would only add to the confusion to adopt the same numbering in Isopoda and Tanaidacea. On the contrary, I would consider it very useful if the terminology of at any rate the Amphipoda could be changed so as to follow that of Isopoda and Tanaidacea as already done for instance in the Faune de France (l.c.).

4. In accordance with the convention in current use (amongst carcinologists) for the Decapoda the pleopods are numbered 1-5; the last pair of appendages are called uropods.

5. The spelling of the words peraeon (pereion), peraeopod (pereiopod) and peraeonite is not a matter of great importance but may deserve a little more consideration than given to it by Lang (l.c.).

The two former words were, as mentioned above, introduced by Spence Bate (1856). He writes (footnote, p. 27): “From πεςαιόω, *to walk about:* pereion, part which supports the walking legs”. This is, however, not correct. The word means “bring to the other side” or – in the medial and the passive voice – “cross”, and the transliteration should have been “peraioo” (if transcribed letter to letter), “peraeoo” (if transcribed according to the Latin rules) or “pereoo” (in the mediëval-latinized form). The last mentioned way of transcribing is by far the most common in English. Since, however, the form “pereon” is never used, it is more correct to adopt the spelling “peraeon”, although the original terminology was based on a misunderstanding. This form was also used constantly by Stebbing and Calman.

6. The proper use in English of joint, segment and somite is complicated. Originally “joint” only meant articulation or hinge (elbow and knee joint). But now-a-days it has also acquired the meaning of for instance a separate subdivision of an appendage (see The Concise Oxford Dictionary). A similar, but reverse development has taken place in the Scandinavian languages.

Since the latter meaning of joint is now firmly established in current English scientific literature I prefer to use “joint” for the subdivision of appendages, “segment” for the subdivision of the body, and “articulation” for the connection between joints or segments, thus rejecting entirely the word somite. I do so for two reasons: (1) “Segment” is exclusively used in Vermes and almost exclusively in Insecta etc. to indicate sections of the body. (2) In repeated use in descriptions “joint” is the shorter, especially for instance “three-jointed” or “3-jointed.”

I fully agree with the remaining proposals put forward by Lang, e.g. his terminology of carapax and the joints of the chelipeds and the other peraeopods.

C. SYSTEMATIC PART

1. APSEUDIDAE

Notes on the postmarsupial development of Apseudes spinosus

Before describing the new species of *Apseudes,* collected by the Galathea, I have found it useful first to consider for comparison the development of *Apseudes spinosus* M. Sars.

Some years ago LANG (1953b) showed that the Tanaidacea possess a long row of postmarsupial stages. For *Heterotanais antarcticus* he enumerates six preadult and a great many adult stages. In the latter, the stages with brood-pouch are constantly preceded by two intermediate stages the first of which lacks rudimentary oostegites, while these are present in the second intermediate stage. The same developmental pattern is found in other species of Paratanaidae and probably also in Tanaidae. In Apseudidae he suggests the same number of preadult stages, but regards it as probable that in the adult cycle each brood-pouch stage is preceded by one intermediate stage only, which is provided with rudimentary oostegites. He bases this opinion partly on *Apseudes hermaphroditicus* Lang (without giving any details) and partly on *A. spinosus* M. Sars. Of this species he studied 333 adult females, 309 of which were non-eggbearing, and he found that all these had rudimentary oostegites.

In the Copenhagen Museum there is also a fine collection of *spinosus,* comprising 64 adult females from about 20 localities. 20 females have fully developed brood-pouch with or without eggs, and 39 females have rudimentary oostegites. The size of the females of these two groups is very varying, and they no doubt represent several stages. The smallest female with brood-pouch is 8.6 mm long, the smallest with rudimentary oostegites 7.7 mm and two other specimens of this group are 8.2 mm. A careful study disclosed that amongst the rather comprehensive material of small females without oostegites there were five specimens of the following lengths: 7.9 – 8.1 – 8.1 – 8.2 and 8.5 mm.

It will be seen that the shortest female with rudimentary oostegites is shorter than all these five specimens without rudimentary oostegites. Besides, two of the females with rud. oostegites are exactly as long (8.2 mm) as one of the females without (and two other females without are only 0.1 mm shorter). The three equally long females are from three different localities: North Atlantic, 280 m (one female with rud. oostegites); North Atlantic, 358 m (the other female with rud. oostegites – and the smallest female with rud. oost.); Skagerrak, 395-425 m (the female without oostegites). Accordingly, we do not find – at any rate in the first adult stages – in *spinosus* the same fine correlation between length and stage as in *Heterotanais antarcticus* where the various stages evidently correspond to fixed size-groups without overlapping. However, even if the lengths of females of the same stage certainly vary from one locality to another, it is difficult to believe that a female which has rudimentary oostegites, but is only 7.7 mm long, is older than a female which has no oostegites, but is 8.5 mm long.

During his investigations in the Gullmar Fjord (Bohuslän, Sweden) Dr. H. LEMCHE, on my request, kindly collected a fine material of *Apseudes spinosus.* It consists of 49 males and 42 females (Smörkulla, 16. Jan. 1956, 40-50 m). There are altogether 17 females without oostegites (I), 17 with rudimentary oostegites (II), 7 females with eggs in the brood-pouch (III), and 1 more with fully developed oostegites but without eggs (IV). The total lengths of the females are as follows (in mm):

I	7.4 7.6 7.6 7.7 7.9 7.9 8.0 8.1 8.1 8.2 8.3 8.4 8.4 8.5 8.6 8.9 9.1	I
II	8.1 8.1 8.2 8.2 8.4 8.4 8.4 8.4 8.6 8.6 8.6 8.7 8.7 8.7 8.7 9.0 9.2	II
III	9.3 10.0 10.3 10.4 11.2 11.3 12.1	III
IV	12.3	IV

In this case all the females are from the same locality and collected at the same time. Here again we find a considerably greater length (9.1 mm) of the largest female without rudimentary oostegites than of the smallest females with rud. oostegites (8.1 mm). At the same time it is surprising that none of the females with rud. oostegites are larger than any of the females with fully developed oostegites. The apparent lack of size-groups in females without and with rudimentary oostegites does not allow any suggestion of the number of stages represented in the present material.

Thus, both the material from different localities and the rather big collection from one locality seem to indicate that prior to the first egg-bearing stages of *spinosus* come not only a stage with rudimentary oostegites, but also one without oostegites. In the later stages there is certainly only one intermediate stage, since neither LANG nor I have found any large females without oostegites.

In his material of *A. spinosus* LANG found 17 specimens which all belonged to the same manca stage. This is characterized by being furnished with both rudimentary peraeopods VII and pleopods, the former being in accordance with the photograph on pl. 3, fig. 5 (l. c.). In the material from the Copenhagen Museum there are five specimens which probably belong to the same manca stage. The rudimentary peraeopods (fig. 1a) have four distinct joints; the penultimate one is very faintly divided by a transverse seam. The pleopods (fig. 1b) have two setae on each ramus. Besides, there is in the material one specimen in an earlier manca stage, which is devoid of both pleopods and peraeopods VII and thus probably corresponds to the stage of a young specimen of *A. gracillimus*, mentioned by LANG (l. c.) The length of the youngest specimen is 3.3 mm, and of the five firstnamed specimens: 4.1 – 4.4 – 4.4 – 5.0 and 5.0 mm. A close examination did not reveal any differences in the five specimens with rudimentary peraeopods VII and pleopods (except some variation in number of joints in the endopodites of the uropods). Nevertheless, it is difficult to believe that all the five specimens belong to the same manca stage, when the great difference in size is considered, the more so since the smallest of the five is closer in size to the specimen of a younger stage (3.3 mm) than it is to the two longest specimens of the same appearance. The representatives of the first youth stage (with all peraeopods and pleopods fully developed) are only 5.6 mm long; again the interval in length between specimens belonging to two different stages is smaller than the interval between the longest and shortest of the five specimens. On the other hand, one should expect morphological differences, although small, between the later manca stages, but in the present material I have looked for them in vain. So far it can only be said that *spinosus* possesses at any rate two manca stages – and probably four, as proved for the Paratanaidae.

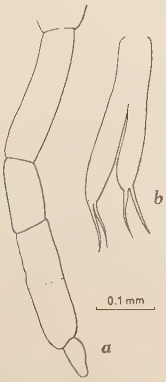

Fig. 1. *Apseudes spinosus* M. Sars, manca stage; a, peraeopod VII; b, pleopod.

The specimen in the youngest manca stage has 5 joints in the exopodite of the uropod and 12 in the endopodite, while the five specimens in the older manca stage(s) have 6 and 18-22 joints respectively.

Apseudes galatheae n. sp.

Material:

St. 658, Kermadec Trench (35°51'S, 178°31'W), 6730-6770 m, 20. Feb. 1952. Gear: 6 m sledge trawl. Bottom: brown sand with clay and stones. Bottom temperature: 1.3°C. – 5 adult females (one with rudimentary oostegites); 2 adult males; 2 preadult specimens.

St. 664, Kermadec Trench (36°34'S, 178°57'W), 4510-4570 m, 24. Feb. 1952. Gear: herring otter trawl. Bottom: brown sandy clay with pumice. Bottom temp.: 1.1°C. – 3 adult females.

Description of female type (from St. 658):

Body (figs. 2 & 3a) extremely elongate, being 9.3 times longer than broad (measured from anterior end of rostrum to posterior end of pleotelson and across the first free peraeonite[1] which is the broadest). Only *A. gracilis* Norman & Stebbing and *gracillimus* Hansen are about as elongated. The decrease in width from peraeonites 2 to 7 is slighter than in most other species. Integument considerably less calcified than for instance in *spinosus*.

Carapax (fig. 3a) a little broader than long (excl. the rostrum). The dorsal surface is rather vaulted, with a distinct transverse furrow and two longitudinal impressions in front of it. Rostrum prominent, triangular, with almost straight margins and no lateral projections at the base; its dorsal surface is quite flat and it is not deflexed. The eye lobes are strongly produced and excavated in front; they are perfectly without visual elements. The lateral processes are shaped like the eye lobes but somewhat smaller and more excavated in front. Epistome with a short and rather thick spine, directed obliquely forwards (fig. 2).

Peraeonites increase in length from 2 to 5 and 6 which are equally long while peraeonite 2 is half as long as these. Peraenite 7 almost as long as 4. The

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[1] For explanation of this term see p. 189.

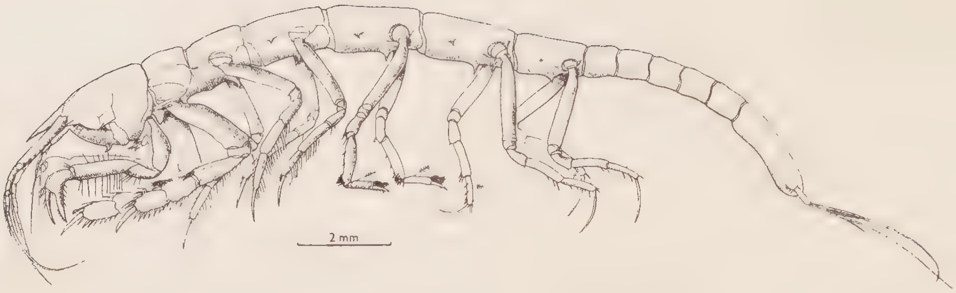

Fig. 2. *Apseudes galatheae* n. sp.; female type from the Kermadec Trench, 6770 m.

shape of the peraeonites almost as in *gracillimus* (HANSEN 1913, pl. 1, 3a), but the spines on the lateral processes of peraeonites 6 and 7 are in *gracillimus* like the preceding ones, while in the type of *galatheae* those on 6 are rather small and those on 7 have totally disappeared, leaving only a rounded process. The coxal plate of peraeopod II almost triangular, having only an acute denticle on the terminal angle as in *gracillimus*. The coxal plate of the following peraeopods small and rounded. The dorsal surface of peraonites 2-5 with more or less conspicuous transverse and longitudinal furrows (fig. 3a). The hyposphenians (the spine-like processes on the peraeon sternites) are present on all segments (fig. 2), the one on peraonite 2 being almost twice as long and stout as the remaining ones. They are always situated a little behind the middle of the segments.

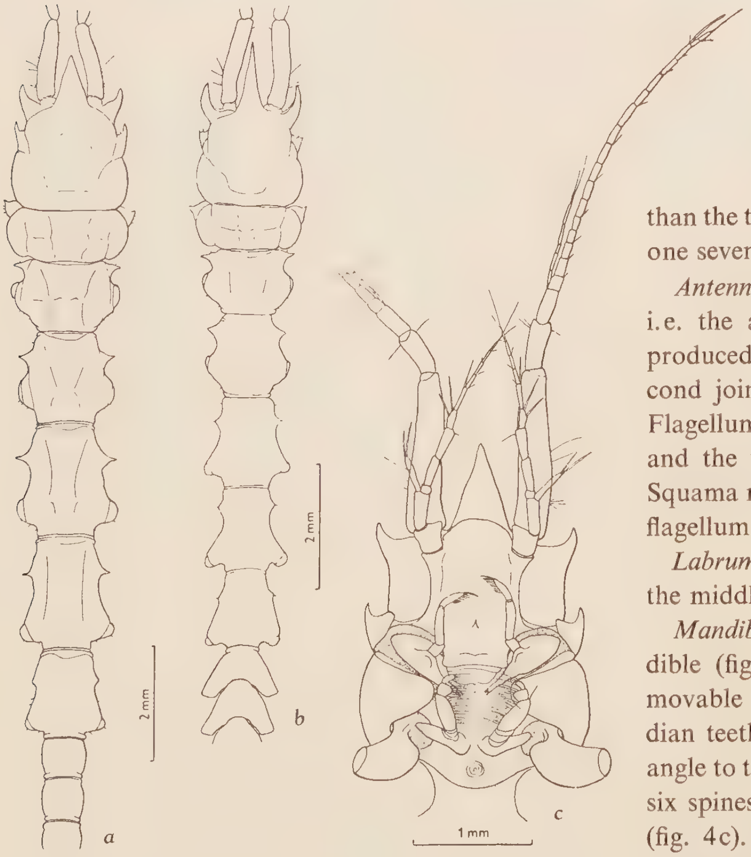

Fig. 3. *Apseudes galatheae* n. sp.; a, female type; b, male D; c, carapax of female type from below.

Pleon (fig. 2) almost as long as the first four peraeonites together. The five pleonites are perfectly identical, cylindrical and a little longer than broad. Pleotelson almost three times as long as each of the preceding segments and three times longer than broad. It is also regularly cylindrical, being only slightly swollen towards the distal end when seen from above or below. An inconspicuous median furrow is found on the outer third of the ventral side.

Antennula (fig. 3c) more than $1^1/_2$ times as long as carapax. The first joint is stout, subcylindrical and almost four times as long as the much narrower second joint, which is again a little longer and broader than the third. The inner flagellum has five, the outer one seventeen joints in the type specimen.

Antenna (fig. 3c) with the first joint almost square, i.e. the antero-interior corner is not so strongly produced as is normally the case in this genus. Second joint one third longer, but much narrower. Flagellum with nine joints of which the second and the third are longer than any of the others. Squama narrow and as long as joints 1 and 2 of the flagellum. It has two stout, terminal setae.

Labrum (fig. 4a) with a short, acute process in the middle of its lower margin.

Mandibles more slender than usually. Left mandible (fig. 4b) has pars incisiva and the distinct movable lacinia horny and 5-dentate, the three median teeth on the lacinia being bent at an oblique angle to the lateral ones. The bunch of spines counts six spines, most of which are bifurcated at the tip (fig. 4c). Right mandible (fig. 4d) has an almost straightly cut pars incisiva. There are also six spines but one is tribly forked, the rest doubly forked.

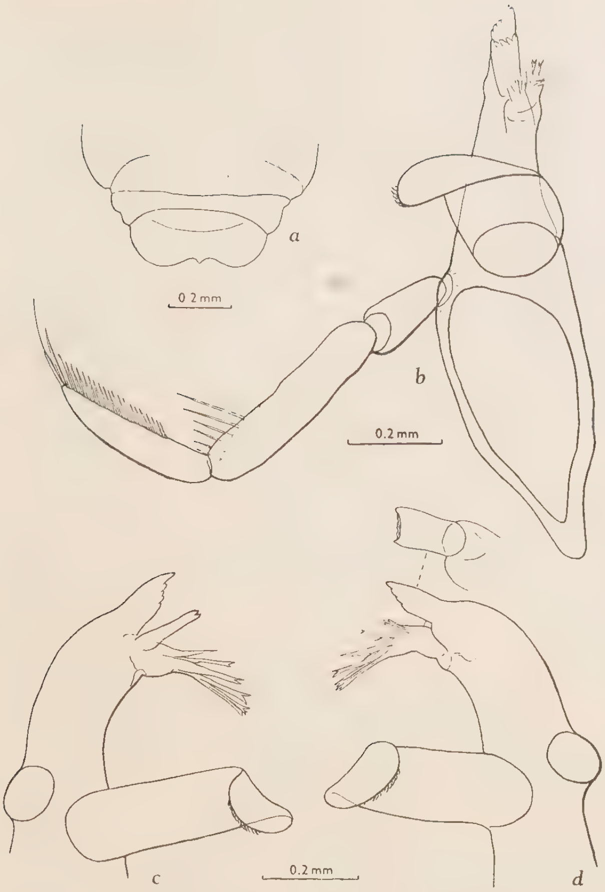

Fig. 4. *Apseudes galatheae* n. sp., ♀; a, labrum; b-c, left mandible; b, from inside; c, from anterior side; d, right mandible from anterior side.

Processus molaris of either mandible is long and tongue-like, with subparallel margins and the distal part bent somewhat backwards and outwards; the tip bears a row af small curved spines or setae. The palp is equal in either mandible, three-jointed, with one short seta on the first joint and six on the second. Joint 3 has a long and a somewhat shorter terminal seta and besides about sixteen closely set setae of which the proximal ones are the shortest.

Maxillula (fig. 5a) of the usual general shape. Internal endite rather short and thick, with six setae or spines on the end and short rows of very fine hairs on the inner margin. External endite with a row of fine setae along the outer as well as the inner margin. The palp is two-jointed the distal joint being furnished with ten simple, very long setae, the distal ones being the longest.

Maxilla (fig. 5b) of the typical shape and furnished with characteristic spines and setae according to the figure.

Labium (fig. 5e) only moderately provided with hairs and with two terminal setae on the lobes.

Maxilliped (fig. 5c) has, in the basal part, a very short first and a much longer second joint although not so long as in other species of *Apseudes*. Both joints unarmed, but the upper, outer margin of second joint with some low and indistinct denticles. The palp with the usual four joints of which the

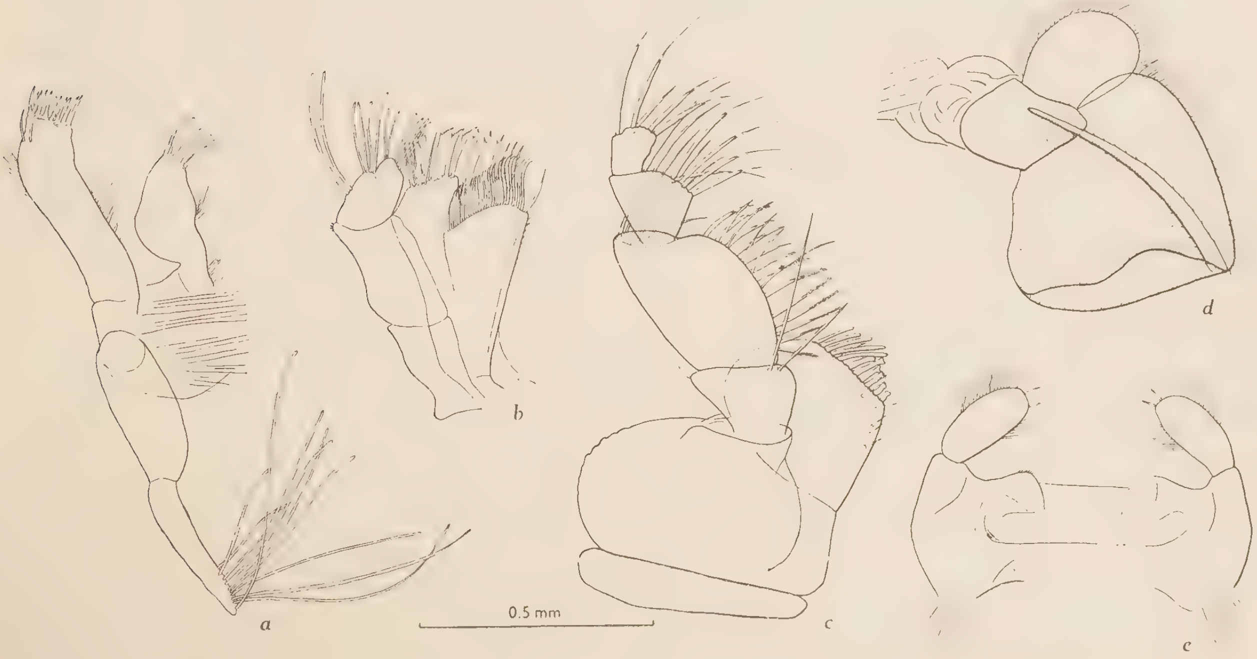

Fig. 5. *Apseudes galatheae* n. sp., ♀; a, maxillula; b, maxilla; c, maxilliped (drawn after a flattened slide specimen); d, epignath of maxilliped; e, labium.

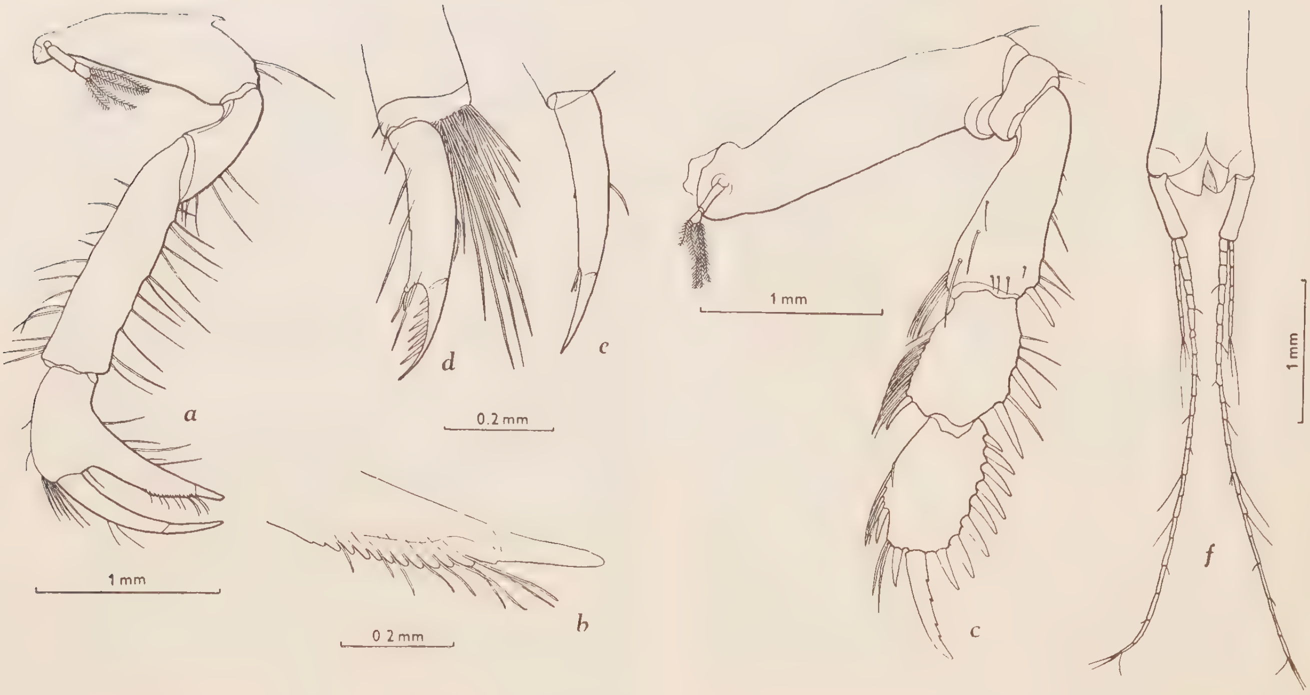

Fig. 6. *Apseudes galatheae* n. sp.; a-d & f, ♀; a, left cheliped; b, cutting edge of fixed finger of left cheliped; c, left peraeopod II; d-e, dactylus and claw of peraeopod V of ♀ and ♂ D; f, uropods from below.

proximal one has a triangular projection on the outer margin, furnished with a small seta and on the opposite angle with a very long and a somewhat shorter seta. The three remaining joints with many setae of which the proximal ones on joint 2 are feathered towards the end. The inner margin of the endite is bent downwards and is provided with four slender hooks which are difficult to see; the distal margin has a closely set row of stout spines. The epignath (fig. 5d) is a large vaulted plate, almost shaped as in *A. spinosus* (Sars 1899, pl. 1), but the plate is subsquarish and furnished with fine hairs along the distal margin, and the lanceolate process in the distal corner is longer and very faintly ciliated.

Cheliped (fig. 6a) rather slender. Coxa very small. Basis more than three times longer than wide, with a dentiform projection beyond the middle of the posterior margin. The exopodite with two joints, the second distally with four fine, feathered setae. Merus only half as long as carpus, with few setae. Carpus almost cylindrical, with a row of long setae on the posterior margin and another row along the inner margin, at right angles to the posterior row. Propus three times as long as broad, about as long as basis; the fixed finger longer than the rest of the joint; the cutting edge with a row of seta and between these a row af about twelve foliaceous lamellae (fig. 6b); only one seta between the gap of the equally long, fixed and movable fingers; the latter with a non-serrated cutting-edge.

Peraeopod II (fig. 6c) has a two-jointed exopodite with four long and thin, feathered setae. Basis four times longer than broad and almost as long as the three succeeding joints together. Merus a little shorter than carpus + propus, which are equally long. The latter is almost oval in shape while carpus is rectangular and a little broader. Apart from the setae, merus has one spine, carpus two, and propus (of the type specimen) eight spines along the posterior margin; on the anterior margin there is one spine on carpus and two on propus. Dactylus is long and stout, with a 4-dentate margin and a very short claw.

Peraeopods III and IV (fig. 2) almost totally identical. Basis about as long as the three succeeding joints combined. Dactylus and claw as long as propus.

Peraeopod V longer and somewhat stouter than III and IV; basis is $^5/_6$ of the three succeeding joints combined. Carpus long and stout, more than half as long as basis. Near the distal end it is provided with two parallel rows of forward directed, spine-like setae. Propus $^2/_3$ of carpus, with a feathered ("auditory") seta on the posterior margin and two fan-shaped rows of spine-like setae on the distal·

end, posterior to dactylus which is short and furnished with a row of short spines on the claw (fig. 6d).

Peraeopods VI and VII (fig. 2) are almost alike, the only differences being that VI has a feathered seta on the posterior margin of propus, which is not present in VII, and that carpus of the latter appendage is a little more curved. These two appendages are also very similar to peraeopods III and IV, but slightly shorter, less setiferous and with a much longer and very slender dactylus which is $1^1/_2$ times as long as propus.

Pleopods not developed.

Uropod with a slender, cylindrical peduncle (fig. 6f); exopodite has six joints; endopodite which is more than four times longer than exopodite has nineteen joints.

Description of male (D):

In the following description only the *differences* between the female and male are pointed out.

Body even a little more elongate than in the female.

Carapax (fig. 3b) somewhat narrower and with distinctly longer and more slender rostrum and eye lobes (the projection on the lateral process is broken off on either side). Rostrum is only $^1/_3$ of the total length of carapax in the female, but $^3/_7$ of its length in the male.

Peraeonites (fig. 3b) on the whole shaped as in the female, but peraeonite 6 is a little shorter than 5. The lateral spines are fully developed only on the anterior peraeonites, on the three posterior being substituted by a rounded process with a minute seta. The longitudinal and transverse furrows are only present on the dorsal surface of peraeonite 2. The hyposphenians are well developed on peraeonites 2-4, but are subacute processes on 5-6 (fig. 7). On 7 there is an unusually long and stout conical projection.

Pleon (fig. 7) a little longer than peraeonites 2-5 together. The five pleonites are equally long and broad, but very different from those of the female due to the presence of pleopods. There are no lateral spines on any of them (fig. 3b). Hyposphenians are present only as rounded processes.

Pleotelson very differently shaped. In the female it is cylindrical throughout, but in the male only the proximal half is shaped in that way. The ventral side of the distal half becomes more and more flattened towards the end. On this flattened area two longitudinal, rounded keels are found which increase in height towards the distal end of pleotelson where they are abruptly cut off. Accordingly, the presence of these keels gives the impression of a cylindrical pleotelson as in the female (fig. 7). When viewed from below they are seen to diverge and to bear two short setae on the hind margin (fig. 8a); only one could be seen on the left keel.

On the dorsal side (fig. 8b) two longitudinal, lateral furrows distinctly divide the distal end of pleotelson into a median part and two lateral sections which serve as a base for the two attached peduncles of the uropods. The median part has a low furrow in the middle which posteriorly ends at a transverse seam; this is furnished with a backwards pointing, median bend, anterior to which there is a low convexity with a pair of setae. The apical anal opening seems to be much smaller than in the female and is difficult to detect.

Antennula (fig. 8c) with the outer flagellum longer and much stouter than in the female; each of the eighteen joints with a bunch of long, sensory hairs.

Antenna (fig. 8c) has the same shape and number of joints as in the female; the setae are only somewhat longer and more numerous.

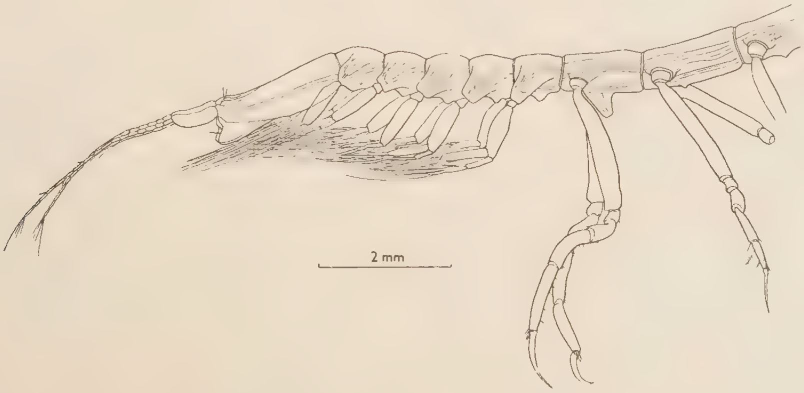

Fig. 7. *Apseudes galatheae* n. sp., ♂ D; posterior end.

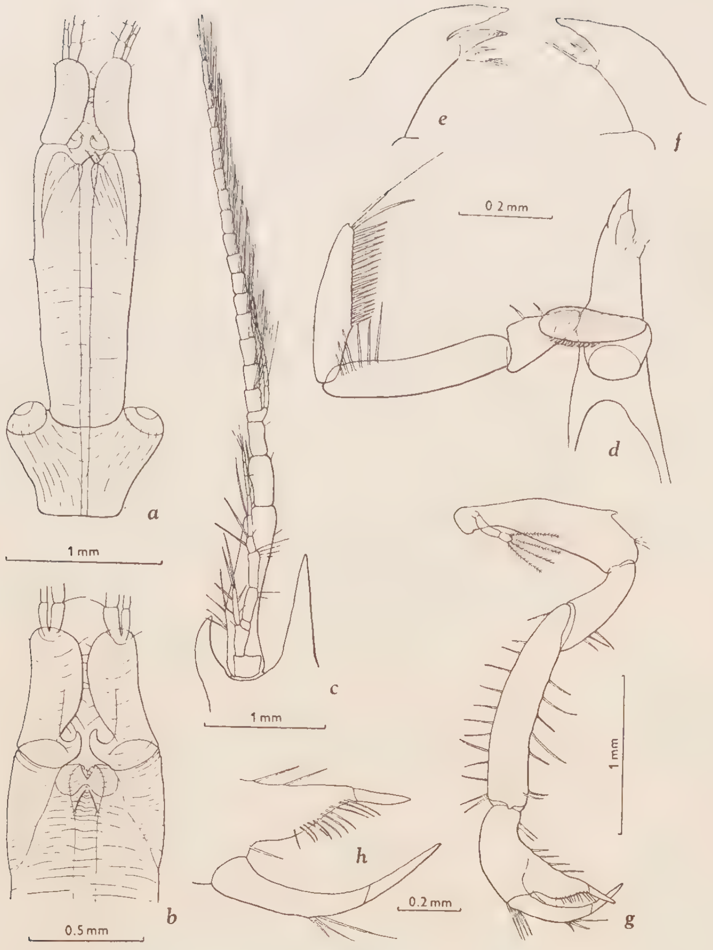

Fig. 8. *Apseudes galatheae* n. sp., ♂ D; a, pleotelson from below; b, distal end of pleotelson and peduncle of uropods from above; c, right antennula and antenna from below; d, left mandible from inside; e-f, lateral view of left and right mandible; g, left cheliped; h, fingers of left cheliped.

Mandibles (fig. 8 d) differ considerably from those of the female. Pars incisiva of both left and right mandible is not flattened and with terminal teeth but almost conical and with minute protuberances. Lacinia mobilis of left mandible almost as in the female, but the spines below it are totally different on either side. From a distinctly marked off basal part several extremely thin, stiletto-shaped spines of varying length emerge (fig. 8 e-f). They are thus quite unlike the stout, mostly bifurcate spines of the female (fig. 4 c-d). Moreover, there are two setae on the first joint of the palp, and the row of spines on the third joint is longer and stouter. The rest of the mandible and all the remaining mouth-parts are quite identical with those of the female.

Cheliped (fig. 8 g) considerably more slender than in the female which is opposite to what is usually the case. Thus basis is almost four times longer than broad. The chelae are rather different; in the male they have a strongly bent and rather long movable finger which involves that the fingers cross. Propus is narrower, but the fixed finger is broader proximally. The cutting edge is absolutely straight (fig. 8 h), without foliaceous lamellae, and there is a row of twelve setae attached below the edge. Otherwise the chelipeds are almost identical.

Peraeopod II also somewhat more slender than in the female, propus for instance being only half as broad as long instead of $^4/_7$ in the female.

Peraeopods III-VI are identical in the two sexes except that the claw on V has no row of short spines (fig. 6 e) and dactylus of peraeopod VI is a little shorter in proportion to propus.

Peraeopod VII rather different. In the female basis is straight, carpus and propus only slightly curved, and the latter considerably shorter than the former which is again somewhat shorter than dactylus (fig. 2). In the male basis is curved somewhat forwards, propus and especially carpus are curved the opposite way (fig. 9 a) and these two joints are equally long, but shorter than dactylus.

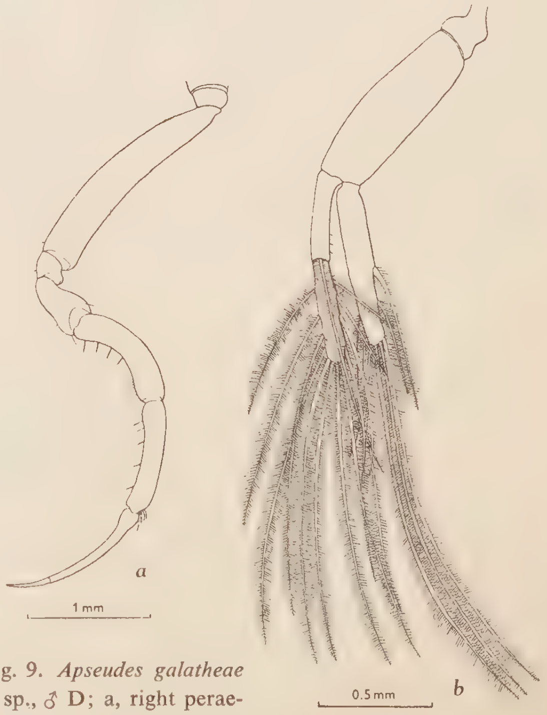

Fig. 9. *Apseudes galatheae* n. sp., ♂ D; a, right peraeopod VII; b, pleopod 1.

Pleopod 1 (fig. 9b) with naked basis and two joints in the exopodite, which is somewhat longer than the endopodite. The remaining pleopods become longer and more slender backwards.

Uropod (figs. 7 and 8a-b). The peduncle is different from what is known in all other species of tanaids. The general shape is somewhat curved, the interior and the ventral sides being convex. In the proximal, interior corner there is on the dorsal side a very prominent, hook-shaped process, which almost reaches the corresponding one on the other uropod. The endopodite has six and the exopodite eighteen joints in the present male.

Size:

The largest female in the material is 20.8 mm long; the female type is 18.3 mm long and 1.9 mm broad across the first free peraeonite. The longest male is 15.6 mm long and 1.7 mm broad.

Development and variation:

Unfortunately, *A. galatheae* comprises only two preadult specimens, five adult females and two adult males.

Preadult specimens. In table 1 this material has been arranged according to total lengths. The smallest specimen, A, is still lacking peraeopods VII and is also devoid of pleopods. Thus it is in a manca stage which probably corresponds to that mentioned on p. 191 *(spinosus)* and on p. 204 *(gracillimus)*. On the whole, the present specimen is very similar to the adult females, having for instance the spines on the claw of pereiopod V developed. The main differences are:

Body (fig. 10) narrower, and carapax almost rectangular with a broader and shorter rostrum which is bent somewhat downwards so that it seems a little shorter in fig. 10. In this stage carapax is 18.7% of the total length while in the type it is 15.6%. This difference in the relative length of carapax is considerably less than in *Heterotanais antarcticus* in which LANG (1953b, p. 416) found carapax to be 27.4% of the total length in the first manca stage and 24.4% in the last manca stage as against 19.1% in the first adult stage with ova. The smaller number of spines on peraeopod II and of joints in antennula, antenna, and uropod is shown in table 1.

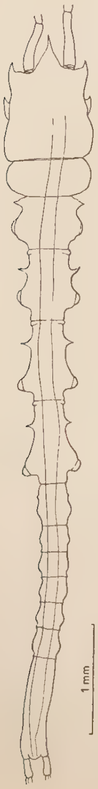

Fig. 10. *Apseudes galatheae* n. sp., manca stage (specimen A).

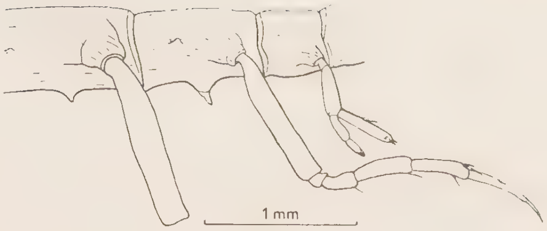

Fig. 11. *Apseudes galatheae* n. sp., preadult stage (specimen B).

The other preadult specimen, B, probably belongs either to the last manca stage or to the first youth stage. It is not possible to coordinate it directly with any of the stages of *Heterotanais antarcticus,* as given by LANG (1953b, p. 415). In this species the last manca stage has very rudimentary peraeopod VII and pleopods (LANG's figs. 3 and 4), while these appendages are fully developed in the succeeding first youth stage. In the present specimen of *galatheae,* however, peraeopod VII is fully developed, although somewhat smaller,[1] while the pleopods are still perfectly rudimentary (fig. 11). Owing to the smaller size of the pleopods I regard it as most likely that the specimen belongs to the last (fourth?) manca stage.

While specimen A resembles the females in practically all the characters in which the adults show sexual dimorphism, B has apparently obtained some male characters, namely pleopods (although rudimentary) and a conspicuous projection on the sternite of peraeonite 7. The pleopods have all the joints developed but have so far only two apical and one posterior seta on the endopodite and probably none on the exopodite. In B the endopodite is the longer, in the adult male the opposite is the case. Seen from above the pleonites show a distinct convexity at the insertion of each pleopod, although by far not so big as in the adult males (fig. 3b). A similar, but very indistinct convexity, is also present on the five pleonites of the preadult specimen A (fig. 10). The projection on somite 7 is furnished with a short spine which is sometimes found also on the conical projection of adult males, but is normally broken off.

However, all the other characters, which are different in the two sexes of the adults, are female in specimen B. This applies to the shape of carapax and

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[1] Since only basis of peraeopod VI is preserved, it is not possible to compare VII with VI, except for the size.

Table 1. Size and variation of the material of *Apseudes galatheae* n. sp.

Galathea Stat.	Specimens	Total length mm	Rudimentary oostegites	No. of spines on lower margin of propus of peraeopod II	No. of joints of antennula		No. of joints of flag. of antenna	No. of joints of uropod	
					Outer flag.	Inner flag.		Exopod.	Endopod.
658	pread. A	6.6	÷	5	9	4	6	5	10
	pread. B	11.5	÷	$6^1/_2$[1]	12	5	8	5	16
	♂ ad. C	14.7	÷	7	18	5	9	7	19
	♂ ad. D	15.6	÷	7	18	5	9	6	18
	♀ ad. E	18.0	+	$9^1/_2$	?	?	9	5	16
	♀ type	18.3	÷	$7^1/_2$	17	5	9	6	19
	♀ ad. F	c. 19.5	÷	$7^1/_2$	?	?	?	7	20
	♀ ad. G	20.6	÷	$7^1/_2$	15	5	9	7	18
	♀ ad. H	20.8	÷	$8^1/_2$	17	5	10	8	19
664	♀ ad. J	13.7	+	9, $9^1/_4$	17	6	10	9	20
	♀ ad. K	14.5	+	$8^1/_2$	18	6	9	8	19
	♀ ad. L	14.2	+	9	17	5	9	8	21

1. The posterior spine is only half as long as the preceding six ones.

rostrum, the relative length of the peraeonites, the cylindrical shape of pleotelson, the inner flagellum of antennula, the shape of the right mandible (the left one was damaged and could not be studied), the cheliped (which is like that of the females F and G, mentioned below), the spines on the claw of peraeopod V, the shape of peraeopod VII (fig. 11), and, finally, the simple peduncle of the uropod, without any proximal hook.

The reason for this apparent mixture of male and female characters in specimen B will be further discussed on p. 230.

Adult females. In table 1 the females have been arranged according to total length. It will be seen that the only specimen with rudimentary oostegites is E, which is the shortest, i.e. the youngest female; this is another evidence of the fact that the tanaids must have several egg-bearing stages.

At the same time the table shows that also in this species there must be two intermediate stages before the brood-pouch stage (which is lacking in the present material), namely an intermediate stage with no rudimentary oostegites (the type and F, G, and H) and an intermediate stage with rudimentary oostegites (E). This is – as shown above – probably also occurring in the first adult stages of *A. spinosus*, and is certainly the case in *A. nipponicus* in which three adult females, according to Shiino (1937, p. 59), were devoid of rudimentary oostegites, but had "a black-coloured stripe in the part where the rudimentary oostegite is found in other females". Similar stripes cannot be found in the present females without oostegites.

In table 1 is given the number of spines on the lower margin of propus of peraeopod II. The number varies from one specimen to another and is independant of the size, except that it is smaller in the preadult stages. This variation within the same population makes it risky to base a subdivision in races or subspecies on this character as recently tentatively proposed for *A. acutifrons* by Lang (1955) – to say nothing of regarding it as a specific character, as done by several former carcinologists.

Table 1 also shows that the number of joints of the outer flagellum of the antennula, the flagellum of the antenna and the exopodite and endopodite of the uropod varies, some of them being apparently independent of the size of the specimens.

The hyposphenians of the present material of females show interesting variations. The armament of the type specimen was described and figured above (p. 192, fig. 2). Table 2 gives the armament in all the preadult specimens and the females, arranged according to increasing size. There is a tendency to reduced armament with increasing size, the hyposphenians of the preadult specimen A being also about twice as long as those of the type and of E.

As will be seen, the hyposphenians are fully developed in a stage with rudimentary oostegites in *galatheae* (and also in *gracillimus* – see p. 205). This fact certainly means that Tattersall is nevertheless right when in his description of *Apseudes africanus*

Table 2. Presence or absence of hyposphenians in preadult specimens and females of *Apseudes galatheae* n. sp. from St. 658.

	Armament of peraeonites					
	2*	3*	4*	5*	6	7
pread. A	S	S	S	S	S	S
pread. B	S	S	S	S	S	P + S
♀ ad. E	S	S	S	S	S	S
♀ type	S	S	S	S	S	S
♀ ad. F	?	?	O	O	O	S
♀ ad. G	P	C	O	O	P	S
♀ ad. H	P	C	O	O	P	P

S = spine; P = rounded process; C = convexity; O = no traces at all. * indicates the peraeonites on which there are rudimentary oostegites in E.

(1925, p. 80) he states that "spines are present in the ♀ on the second and third true thoracic somites", and that at the same time the female "carries four pairs of incubatory lamellae". LANG (1953b, p. 420) identifies these incubatory lamellae with a marsupium and is no doubt justified in maintaining that hyposphenians and marsupium cannot occur simultaneously. But with his expression "incubatory lamellae" TATTERSALL probably meant rudimentary oostegites which are much more lamella-like than the foliaceous oostegites of the marsupium. If this be the case, hyposphenians can very well occur together with "incubatory lamellae", and it is not reasonable to suppose that TATTERSALL in his description confounded the mature female with the immature one of the same material. On the other hand, my table 2 clearly shows that hyposphenians cannot be used as a specific character, and TATTERSALL is *not* right in quoting the presence of spines in the female of *A. africanus* as one of the distinguishing features between this species and *A. hibernicus*, as already maintained by LANG (l.c.).

Apart from the above named, more general variations there are some slighter individual differences in the adult females of *galatheae*. In F and G peraeonite 4 is as long as 7, the movable finger of the cheliped is a little longer than the fixed one, and G has the rostrum bent somewhat downwards; H has all the lateral spines a little more slender and exhibits a peculiar lack of calcification of carapax and the first four peraeonites which are transparent and yellowish in contrast to the calcified and white, distal peraeonites and pleon. This is probably due to recent moulting.

Also the three females from St. 664 have been compared very carefully to the type. They all have rudimentary oostegites and are perfectly without pleopods. Morphologically they only differ from the type in the following respects: Dactylus of peraeopod II has more teeth (from five to seven), the setae on propus of peraeopod V are still more numerous and a little longer, and female L has the first joint of the antennula one fifth shorter than in the type. As appears from table 1 the number of spines on the lower margin of propus of peraeopod II, of joints in flagella of antennula, and in exopodite and endopodite of uropod is larger than in the other adult females of this species.

Table 1 also gives the total length of the females from St. 664; they are much shorter than the five adult females from St. 658 and even shorter than the two adult males from that station. Of course the material is too small to say anything definite, but it is worth mentioning that the Galathea caught several specimens of the isopod *Ilyarachna antarctica* Vanh. in the Kermadec Trench, among others at the same two stations; also in that species the largest specimens were those caught deepest down (WOLFF 1956a, p. 111).

Adult males. I have not been able to find any greater differences between the two adult males C and D. The only ones worth mentioning are the variation in number of joints of the uropods (see table 1) and the fact that the ventral projection on peraeonite 7 is even larger in male C than in D. Both males are semitransparent and yellow like the proximal half of female H.

Female – male. While working with this species I was several times inclined to believe that the female and male specimens could not belong to the same species. The differences between them are so essential that they would normally be regarded as specific, especially regarding the shape of the mandibles. Had it not been for the fact that I – through a study of the closely related *Apseudes gracillimus* Hansen – found the same fundamental differences between the two sexes (see p. 203), I would probably have described the present females and males as belonging to two species of which males and females, respectively, were still unknown.

To sum up, the males of *galatheae* differ from the females in the following outer characters:

(1) Carapax is narrower and rostrum and lateral projections longer and more slender.
(2) Presence of a stout conical projection on ventral side of peraeonite 7.

(3) Presence of two rounded, longitudinal keels on ventral side of pleotelson and of a smaller anal opening.
(4) Inner flagellum of antennula stouter and with numerous sensory hairs.
(5) Mandibles reduced, pars incisiva of both mandibles being conical and the spines simple and stiletto-shaped.
(6) Cheliped more slender except propus; the fixed finger with a simple cutting edge; the movable finger considerably longer than the fixed.
(7) Peraeopod II somewhat more slender.
(8) Claw of peraeopod V simple.
(9) Peraeopod VII S-curved.
(10) Peduncle of uropod curved and with a prominent hook on the proximal, interior corner.

In order to check the sexual dimorphism of the mandibles I have studied the mouth-parts of one more female and male of the material and found them absolutely identical with those of the female type and the described male, respectively. I found only a slight difference in the number of setae on joint 3 of the mandibular palp in the males.

The question of probable protandric hermaphroditism in this species is discussed on p. 230.

Remarks:

Closest to *A. galatheae* are probably *A. gracillimus* Hansen and *A. gracilis* Norman & Stebbing. A comparison between these three species is given below (p. 207).

A. galatheae also shows some resemblance with *Apseudes leptodactylus* (Beddard)[1] in general shape, especially of carapax and peraeonites. Among many other things *leptodactylus* differs in the following: Very strong lateral spines on the distal peraeonites, extreme shortness of antenna and a strong projection on its first joint; shape of maxillula; extreme slenderness of cheliped; coxal spines on the distal peraeopods.

Also the two deep-sea species *A. sibogae* and especially *weberi* resemble *galatheae* to some extent. The former lacks, however, lateral spines on carapax and peraeonites, it has a rounded eye lobe, a strong coxal spine on peraeopod II, differently shaped mandibles and labium, etc. *A. weberi* is perhaps as close to *galatheae* as any of the two other species mentioned above, having the same general shape of body and chelipeds, labium and maxillula. The mandible figured by NIERSTRASZ (1941, pl. 2, 22) seems to be rather close to the unique mandible of the males of *galatheae* and *gracillimus* (figs. 8d-f and 17a-d); it is not unlikely that *weberi* shows others of the interesting sexual differences, found in the two former species. In this case NIERSTRASZ has overlooked the longitudinal keels on pleotelson, as HANSEN did in *gracillimus* (see below).

Distribution:

So far *A. galatheae* is known only from the Kermadec Trench NE of New Zealand, 4510-4570 m and 6730-6770 m; 1.1° and 1.3°C.

Apseudes gracillimus Hansen, 1913

In order to make possible a careful comparison between the two closely related species *A. galatheae* n. sp. and *gracillimus* Hansen I have found it necessary to give here a redescription of the latter species. In the first place the material of *gracillimus* originates from the Thor (included in HANSEN's Report on the results of the Ingolf Expedition, 1913, p. 15). Moreover, the Ingolf caught at St. 22 a manca stage which was not mentioned by HANSEN (see p. 204). Finally, going through the Galathea collections of tanaids from the abyssal zone, I found two males which I have also referred to this species. The data of the total material of *gracillimus* are given below. – I have chosen the best preserved female (with rudimentary oostegites) from the Thor as lectotype and based the following description on this specimen and on the best preserved male specimen (named E) from the same station. In the descriptions are only included features not described by HANSEN (l.c., p. 15, pl. 1, 4a-4e).

Material:

Taken by the Thor: St. 166, South of Iceland, 62°57′N, 19°58′W, 957 m, 14. July 1903. Gear: dredge. Bottom temperature: 4.9 °C. – 8 adult females, 4 adult males, 3 preadult specimens, some rather damaged.

Taken by the Ingolf: St. 22, South of Greenland, 58°10′N, 48°25′W, 3474 m, 22. June 1895. Gear: dredge. Bottom: soft grey ooze, without any sand. Bottom temp.: 1.4°C. – 1 preadult specimen.

Taken by the Galathea: St. 193, off Southeast Africa, 32°34′S, 31°52′E, 3680 m, 6. Feb. 1951. Gear: shrimp otter trawl. Bottom: Globigerina ooze. Bottom temp.: 1.1°C. – 2 adult males.

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[1] I fully agree with LANG (1949, p. 4) in rejecting the genus *Leiopus*.

Description of female (lectotype):

Body (HANSEN's fig. 4a) almost as elongate as in *galatheae,* being 9.2 times longer than wide. Colour in alcohol yellowish.

Carapax as in HANSEN's fig. 4a, the only exception being that the spines on the lateral projections are longer and more slender. The inner margin of the eye lobe has two rounded processes, one about half way between base and apex of the lobe and in the same plane as rest of the lobe; the other is close to the base and directed somewhat upwards, forming a keel which is divided from the basal part of the lobe by a short furrow. Something similar is found in *A.gracilis* (HANSEN 1913, pl. 1, 3a), but is not so pronounced. The spine on the epistome is long and slender.

Peraeonites according to HANSEN's figure, but there is a distinct, slender spine on the lateral process of peraeonite 3. Peraeonites 5 and 6 are a little longer and broader than 7, but have the same shape. Peraeonite 7 is a little longer than 4 while the opposite is the case in *galatheae.* The hyposphenians are present on all peraeonites and are long and slender. On the three anterior peraeonites they are directed somewhat backwards, on the three posterior ones downwards.

Pleon as in HANSEN's fig. 4b, with the first pleonite a little longer than the succeeding four ones. Hyposphenians very long and slender on all five pleonites.

Pleotelson longer than the three preceding pleonites. The shape is cylindrical, but somewhat broadened posteriorly, with a pair of inconspicuous, rounded, ventro-lateral processes near the base, and with a low, ventral furrow distally. The distal end is regularly rounded dorsally and the posterior margin is provided with a median, rounded process (HANSEN's fig. 4b), which is bent downwards and has two terminal setae. Finally, pleotelson is furnished with a few lateral, spine-like setae, directed backwards and not shown in HANSEN's figure.

Antennula has nineteen joints in the right and eighteen in the left outer flagellum, and five joints in the inner flagella (in all cases with the basal, common joint included).

Antenna with the first joint almost square as in *galatheae.* Flagellum with altogether ten joints (inclusive the two long basal joints which HANSEN referred to the peduncle). Squama one fifth longer than joints 1 + 2 of the flagellum, with two long terminal setae and laterally with two shorter outer and one, equally long, inner seta.

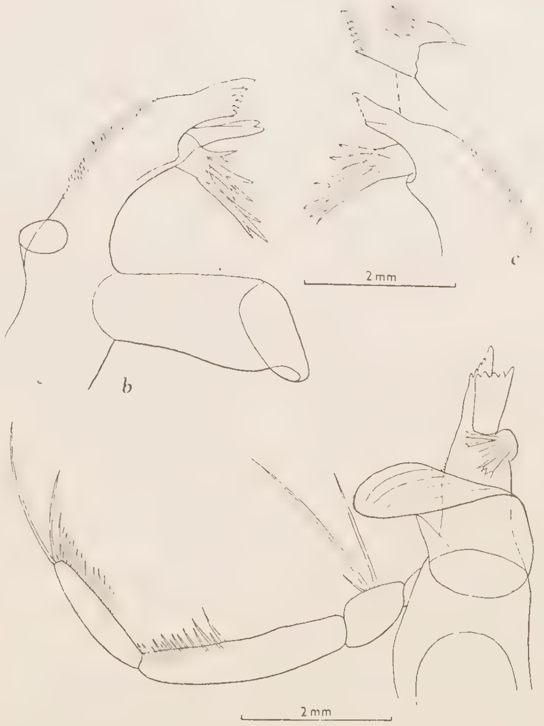

Fig. 12. *Apseudes gracillimus* Hansen, ♀ lectotype; a, left mandible from inside; b-c, lateral view of left and right mandible.

Mandibles (fig. 12a-c) mainly shaped as in *galatheae,* but with several differences: The distal part, beyond processus molaris, is very slender and with an outer, evidently "woolly" clothing of short hairs; pars incisiva of both mandibles with six, rather pointed teeth; movable lacinia with the five teeth in one plane; four spines only in the bunch of spines, three of which are doubly and one tribly forked; processus molaris long, tongue-like and with a distal bend as in *galatheae;* first joint of the palp with two long and one short seta and distal half of second joint with many short setae.

Maxillula (fig. 13a) very close to that of *galatheae,* but with fine hairs on the outer margin of the internal endite instead of on the inner one and with fewer long, simple setae on the distal part of the two-jointed palp.

Maxilla according to fig. 13b; it differs from that of *galatheae* in the shape of some of the spines only.

Labium (fig. 13c) with rather long, fine hairs and with three terminal setae on the lobes.

Maxilliped also very close to that of *galathea* (fig. 5c, p. 193). The only differences seem to be the lack of one (both?) setae on the inner distal corner of joint 1 of the palp and the absence of feathered setae on the proximal part of joint 2.

Cheliped according to HANSEN's description and fig. 4c, except that propus has five instead of two

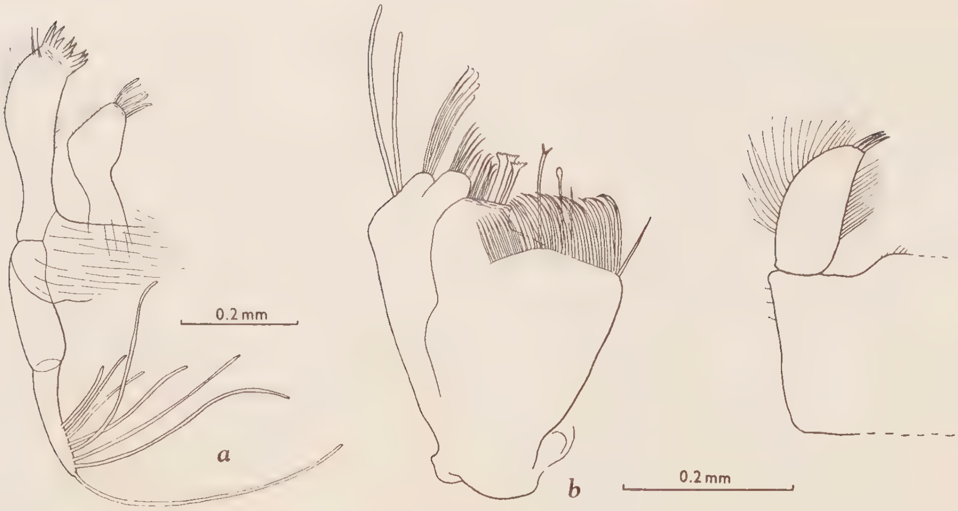

Fig. 13. *Apseudes gracillimus* Hansen, ♀ lectotype; a, maxillula; b, maxilla; c, labium.

setae at the insertion of the movable finger, and the fingers are even a little longer, compared with the rest of the hand, than shown by Hansen.

Peraeopod II as figured by Hansen (4d). The type has 6, almost equally long spines on the lower margin of the right propus, and 6 equally long + 1 somewhat shorter spine on the left propus – as in *A. hermaphroditicus* (Lang 1953a). Dactylus with four denticulations (Hansen records three only (p. 16), but shows four in fig. 4d).

Peraeopods III and IV almost equal, but propus is much longer in III which has also more setae along the margins of carpus and propus.

Peraeopod V almost as in *galatheae*, but dactylus is much more slender, and there are fewer terminal setae on propus (fig. 14a).

Peraeopods VI and VII almost equal and both with a rather strong spine in the row of short setae along the anterior margin of propus (not shown in Hansen's fig. 4e). Propus has a feathered ("auditory") seta on propus of peraeopods V and VI but not on VII.

Pleopods (fig. 15a) considerably more slender than in the males of *galatheae*. Basis has two feathered setae. The exopodite is the shorter, and its proximal joint is only one third of the distal one.

Uropods with a simple, cylindrical, basal peduncle in both sexes. The rami are missing in the female type. In the only specimens (males H and R), in which the endopodite is preserved, it has 27 and 23 joints, respectively, and is as long as pleotelson and the three preceding pleonites together. The exopodite is preserved only in males F and R; it is half as long as pleotelson and has 8 (?9) and 7 joints, respectively.

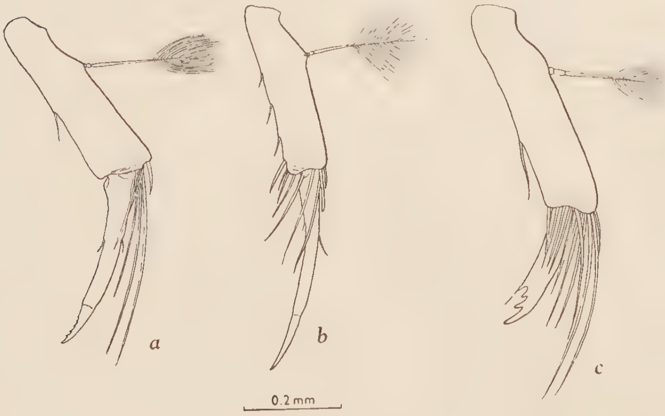

Fig. 14. The two distal joints of peraeopod V; a-b, *Apseudes gracillimus* Hansen, ♀ lectotype and ♂ E; c, *A. gracilis* Norman & Stebbing, ♀ from Ingolf St. 10.

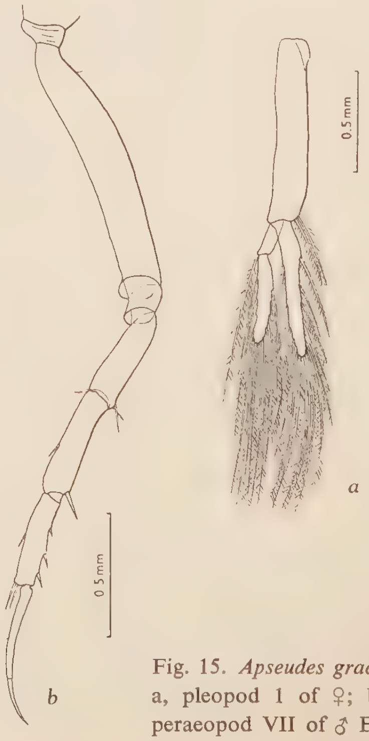

Fig. 15. *Apseudes gracillimus;* a, pleopod 1 of ♀; b, right peraeopod VII of ♂ E.

Description of male E:

A careful investigation of the males disclosed remarkable differences. I have therefore named the males, and shall in the following mention the sexual as well as the individual differences in the males at my disposal. At first the difference between male E and the female type specimen are pointed out.

Body more elongate, especially the posterior peraeonites.

Carapax a little narrower, but by far not so much as in *galatheae,* and rostrum and projections are not longer than in the female. The branchial areas are somewhat more vaulted and their outer margin more convex so that this part becomes broader than the first peraeonite.

Peraeonites equal in shape but the lateral processes broader and directed outwards instead of somewhat forwards. Peraeonite 4 is a little longer than 7. The hyposphenians are present on all segments.

Pleon (fig. 16a) has rather short hyposphenians on the four anterior pleonites and that on 5 is rounded.

Pleotelson shorter and stouter, only as long as the three preceding pleonites together. The general shape is cylindrical and there are the same ventro-lateral, proximal processes and spine-like setae as in the female. But the distal end is very different from that of the female and similar to the shape in the male of *galatheae*. Ventrally the same rounded, longitudinal keels are found (fig. 16b-c), but they are shorter and lower in this species; they have two-three setae on the rounded, distal end. The transverse, ventral seam at the distal end of pleotelson has a median convexity from which a low furrow stretches forwards (fig. 16c). As on the dorsal side in *galatheae* the two lateral sections which serve as a base for the peduncles of the uropods are raised and separated from the median section by a low furrow. Distally the two lateral sections are provided with three strong setae. – On the dorsal side (fig. 16d-e) the same median and two lateral sections as those ventrally are found. The median part is much more raised than in *galatheae* and consists of the same median convexity with two setae, but in addition of two lateral convexities. The posterior limitation is also somewhat different, being furnished with a downwards bent, rounded plate, which in a lateral view (fig. 16e) like a roof is seen to cover part of the anal opening (it is also indistinctly visible in the female); it bears two apical setae. The anal opening, finally, is like in the female, i.e. presumably much bigger than in *galatheae*.

Antennula has the outer flagellum longer than in the female (it reaches back to the middle of peraeonite 5, instead of to the front margin of 4). It is also much stouter, some of the proximal joints being even broader than long, and it has 25 joints, all with long, sensory hairs. The inner flagellum has six long joints.

Mandibles (fig. 17a-d) show almost the same sexual differences as in *galatheae,* i.e. they are somewhat reduced. Both incisive parts are nearly conical, at any rate in the left mandible. Lacinia mobilis (fig. 17b) flattened, but only faintly dentate along

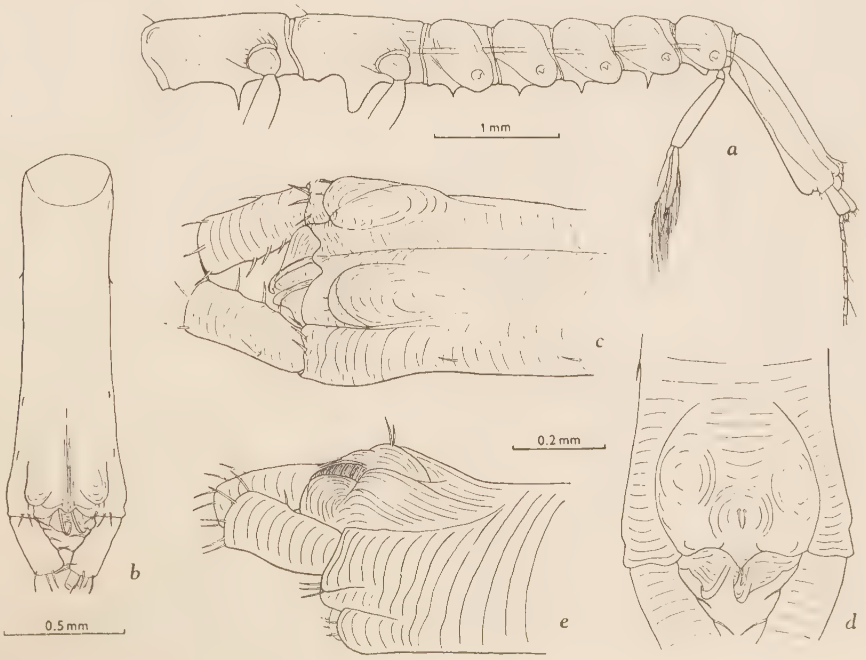

Fig. 16. *Apseudes gracillimus,* ♂ E; a, lateral view of peraeonites 6 and 7 and pleon; b, pleotelson from below; c, distal end of pleotelson and peduncle of uropods, obliquely from below; d, distal end of pleotelson from above; e, distal end of pleotelson and peduncle of uropods obliquely from above.

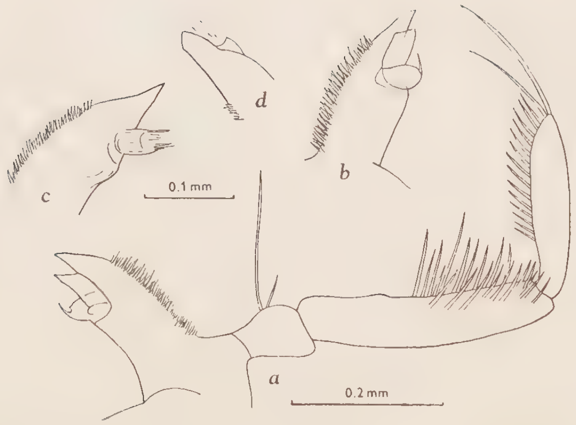

Fig. 17. *Apseudes gracillimus*, ♂ E; a-b, left mandible; a, from posterior side; b, distal end from inside; c-d right mandible; c, from posterior side; d, from outside.

the edge. The spines on the right mandible stiletto-shaped as in *galatheae* and almost missing on the left. Palp much larger in proportion to the mandible and with only two setae on the first joint but numerous, rather stout setae on the second. The molar parts as well as the remaining mouth-parts equal in the female type and male E.

Cheliped even a little more slender than in the female. Relative length of fingers as in female.

Peraeopods III-IV and VI-VII as in the female. Thus the sexual difference in peraeopods VII (fig. 15b) is not found in this species.

Peraeopod V has a longer dactylus and no spines on the claw (fig. 14b). The arrangement of setae on propus is also somewhat different in the two sexes.

Size:

The largest female is 14.4 mm long; the female type is 13.9 mm long and 1.5 mm wide across peraeonite 2. The largest North Atlantic male is 11.6 mm long and 1.3 mm wide across carapax, and the largest male from the Indian Ocean is 14.5 mm long.

Development and variation:

The present material comprises four preadult specimens, eight adult females and six adult males.

Preadult specimens. An early manca stage of *gracillimus* without peraeopods VII and pleopods was described and figured by LANG (1953b, pl. 3, fig. 3-4). The specimen was caught by the Ingolf Expedition (St. 22), but was not included in HANSEN's Report (1913). Professor LANG has kindly returned the specimen to me and – apart from the lack of the said appendages – it corresponds exactly to the specimens belonging to a later manca stage, mentioned below. In table 3 this specimen (A) and the remaining material of *gracillimus* has been arranged according to size.

The three largest preadult specimens (B-D) have rudimentary peraopods VII and pleopods and are in the last manca stage or perhaps in the last but one, provided that the last manca stage has fully developed, although smaller, peraeopods VII and rudimentary pleopods (see discussion p. 197). At any rate this stage certainly corresponds to that in *spinosus*, described by LANG (1953b, p. 419, fig. 5) and by me on p. 191, fig. 1. However, in *gracillimus* the rudimentary peraeopod VII has five distinct joints (fig. 18), while in *spinosus* the penultimate joint is only very faintly (or not at all) divided into two.

All four manca specimens are narrower than the adults. In A the carapax is 14.7% of the total length, in B-D 14.5%, while in the type it is 13.7% of the total length, i. e. still less difference than in *galatheae* (p. 197). The length of squama of the antenna is very varying. In the adults it is one fifth longer than the two first joints of the flagellum together, but in A it is only half as long, and in B-D it is $^3/_5$, almost as long, and as long as the two joints combined. The hyposphenians are not relatively longer than in the adults. Finally, table 3 shows the smaller number of spines on peraeopod II and of joints in antennula and antenna. A has the rami of the uropods preserved; there are 5-6 joints in the outer and 11 in the inner ramus.

Adult females range from about 12.4 mm to 14.4 mm (Table 3). Only in two females (the type and P) was the total body preserved. In the remaining ones preferably pleon and sometimes 1-2 or more of the posterior peraeonites were lost; the actual length of these specimens could therefore be given only tentatively by measuring (by micrometer-objective) the lengths of the carapax and the preserved seg-

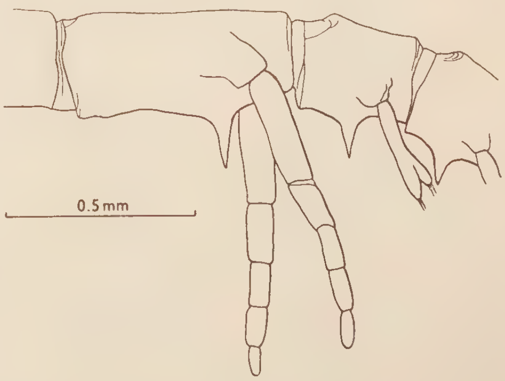

Fig. 18. *Apseudes gracillimus*, specimen B (probably last manca stage); peraeonite 7 and pleonites 1 and 2.

Table 3. Size and variation in the material of *Apseudes gracillimus* Hansen and *A. gracilis* Norman & Stebbing.

Species	Locality	Specimens	Total length mm	Oostegites and eggs	Hypo-sphenians	No. of spines on lower margin of propus of peraeopod II	No. of joints of antennula		No. of joints of flag. of antenna
							Outer flag.	Inner flag.	
Apseudes gracillimus	North Atlantic	pread. A	7.2	none	S[3]	3-$3^1/_2$[4]	9	3	7
		pread. B	7.6	none	S	$3^1/_2$	12	4	7
		pread. C	7.6	none	S	–	12	4	7
		pread. D	c. 7.8	none	S	$3^1/_2$	12	4	7
		♂ ad. E	10.9	none	S	$5^1/_2$-$6^1/_2$	25	6	11
		♂ ad. F	11.1	none	S	6	24	5	10-11
		♂ ad. G	c. 11.3	none	S	6	26	5	10-11
		♂ ad. H	11.6	none	S	$5^1/_2$	24	4	10
		♀ ad. I	c. 12.4	none	S	5	16	4	9
		♀ ad. K	c. 12.7	none	S	$6^1/_2$	–	–	11
		♀ ad. L	c. 13.3	eggs	C[3]	7	–	5	11
		♀ ad. M	c. 13.8	rud.[1]	S	$6^1/_2$	17-18	5	11
		♀ ad. N	c. 13.9	devel.[2]	C	6	15	–	9
		♀ type	13.9	rud.	S	6-$6^1/_2$	18-19	5	11
		♀ ad. O	c. 14.2	rud.	S	–	–	–	–
		♀ ad. P	14.4	rud.	S	–	17-18	5	11
	Indian Oc.	♂ ad. Q	9.5	none	S	6	21	6	8
		♂ ad. R	14.5	none	S	7	26	6	11
A. gracilis	N. Atlantic	pread.	5.8	none	S	5	9	3	7
		♀ ad.	13.6	rud.	S	8	16	4	11

1. rud. = rudimentary oostegites.
2. devel. = fully developed oostegites.
3. S = spines; C = convexities.
4. One peraeopod with three spines, the other with four of which the posterior one is only about half as long as the remaining ones.

ments and comparing them to the intact specimens. The error should be less than ± 0.1 mm.

Also the present material shows that there must be several egg-bearing stages, since one of the smallest females (L) is egg-bearing.

According to table 3 there is the same variation in the number of spines on propus of peraeopod II and in the number of joints of antennula and antenna as in *galatheae;* these characters are presumably independent of the age of the specimens.

The hyposphenians do not show the same variation as in *galatheae*. They are present as spines in all specimens – except those in a brood-pouch stage (L and N) in which they are visible only as low convexities.

Apart from the above mentioned variations I have not been able to find any notable differences amongst adult females.

Adult males. There are six specimens which must be considered males belonging to *gracillimus*. Male E was described and compared to the female type above. Besides there are five males (F-G-H and Q-R, see table 3), which are all furnished with the prominent ventral projection on peraeonite 7, a long and stout, multi-segmented exopodite on antennula and vaulted branchial areas on the carapax.

If we first consider the two males (Q and R) from the Indian Ocean we find that, apart from the great difference in size[1], they are practically identical. Moreover, they agree with the males from the North Atlantic (especially E) to an extraordinary extent, when the vast geographical distance is taken into account. They differ from male E in the following respects:

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[1] A considerable difference in size of adult specimens of the same tanaid species is often found in populations from various localities – e. g. females of *Neotanais serr. serratispinosus* from the North Atlantic, dredged by the Valourus, the Porcupine, and by the Ingolf Expeditions.

Peraeonite 5 is somewhat longer, and 4 and 6 somewhat shorter than in E which has 5 and 6 almost equally long; thus, peraeonite 5 is considerably longer than 6 which is again only a little longer than 7. – The lateral spines on the peraeonites are less slender, being almost triangular in dorsal view. – Epimera of the pleonites are a little more rounded. – The longitudinal, rounded keels on the distal, ventral side of pleotelson are a little longer and stouter in male R, while in Q they are exactly as in E. – Also dorsally Q's pleotelson corresponds to that of E, while in R the downwards bent, rounded plate distally is shorter and less projecting and lacks the two apical setae; on the other hand, the two setae on the median convexity are considerably longer than in E and Q. – The left mandible has 4-5 distinct teeth on the movable lacinia and one bifid spine (together with some reduced ones) in the spine-row; the palp of male Q differs in having the third joint somewhat less than half as long as the second; apart from these features the mandibles are identical. – Maxillula has fine hairs on both margins of the internal endite. – The hand of the cheliped is not quite so elongate. – Basis of peraeopod II is much thicker and shorter, but propus is a little more elongate than in E. – Pleopod 1 has the rami equally long, and the proximal joint of the exopodite is proportionately longer than in E.

None of the above mentioned differences are significant enough to justify a separation into two species or subspecies.

Besides E three more males (F, G, H) were caught by the Thor at St. 166 in the North Atlantic. Of these only G has the pleotelson shaped as described for E above (p. 203). In F and H it is almost cylindrical, although the distal, dorsal convexities and the ventral keels are very faintly visible in F. Besides, F's pleotelson is as long and slender as that of the females. Both in F and H the lateral processes on most peraeonites are narrower and directed forwards as in the females. Moreover, they differ in having the claw of peraeopod V shaped almost as in the females (fig. 14a), while the corresponding claw in E (G has no peraeopods V) is simple (fig. 14b). The mandibles of F and H (those of G could not be studied) are also like those in the females (fig. 12), i.e. not reduced. Finally, the exopodite of the antennula in F and H is shorter by $^{1}/_{5}$ than in E and G and is lacking the abundance of sensory hairs.

G differs from E only in two characters: Flagellum of the antenna has only nine joints, and the squama is considerably longer, reaching to the middle of joint 3 of the flagellum instead of only about one fifth in the other males and the females (cf. the variation in length of squama in the preadults).

The above mentioned differences in the four males from St. 166 can be summarized as follows:

Male characters	Found in males
Lateral processes on peraeonites stout and directed outwards	E, G
Stout, ventral projection on peraeonite 7	E, F, G, H
Pleotelson shorter and stouter	E, G, H
Pleotelson with keels etc.	E, G
Vaulted brancheal areas	E, F, G, H
Stout, multi-jointed exop. on antennula	E, F, G, H
Exop. of antennula with sensory hairs	E, G
Mandibles reduced	E, ? G
Claw on peraeopod V simple	E, ? G

Female characters	Found in males
Lateral processes slender and directed forwards	F, H
Ventral spine only on peraeonite 7	
Pleotelson long and slender	F
Pleotelson without keels etc.	H
Branchial areas not especially vaulted	
Slender exop., and with fewer joints	
Exop. of antennula without sensory hairs	F, H
Mandibles not reduced	? G, F, H
Claw on peraeopod V with spines	? G, F, H

Intermediate character	Male
Pleotelson with very small keels etc.	F

The significance of these features will be discussed below (p. 230).

Distribution:

South of Iceland (62°57'N, 19°58'W), 960 m, South of Greenland (58°10'N, 48°25'W), 3470 m, and off Southeast Africa (32°34'S, 31°52'E), 3680 m; from 1.1-4.9°C.

Apseudes gracilis Norman & Stebbing, 1886

In his report on the Ingolf Tanaidacea (1913) HANSEN separates *A. gracillimus* from *gracilis* preferably on the following characters in *gracillimus:* "The considerably longer inner flagellum of the antennulae, the extreme slenderness of the chelipeds, no serration or setigerous area on the fixed finger of the chela, finally the oblong fifth joint of second pair of legs". Some of these features are, however, certainly stage characters.

In the Copenhagen Museum are only kept the adult female and the manca stage of *gracilis,* taken by the Ingolf Expedition. I have compared the female to the material of *gracillimus* and found some differences which were not mentioned by HANSEN. Most of these are probably only stage characters (for instance the more slender carapax and elongate rostrum, the lateral convexity on the peraeonites in front of the lateral processes, the short and only four-jointed inner flagellum of the antennula, and the presence of only two setae on the much shorter squama of the antenna in *gracilis).* A few other features are possibly specific: The much shorter and very differently shaped dactylus and claw on peraeopod V in *gracilis* (fig. 14 c, p. 202), the differently shaped rows of spines on propus of peraeopods VI and VII – see pl. 20 in NORMAN & STEBBING (1886) and pl. 1, fig. 4e in HANSEN (1913), the considerably longer pleopods with equally long rami, and the low, extended convexity in the middle of the ventral side of pleotelson in *gracilis.* The number of spines on peraeopod II and of joints in antennula and antenna appears from table 3, p. 205, which also gives the length of the manca specimen and the adult female of *gracilis.*

The manca specimen is without peraeopod VII and pleopods. It is considerably smaller than the smallest preadult specimen of *gracillimus* (A). It differs from A especially in the following respects: Carapax and rostrum are longer, it has the same ventral convexity on pleon and shape of claw on peraeopod V as the adult female, and the lateral, distal corners of pleotelson are more projecting.

I have found it beyond the scope of the present study to try to reach to a final conclusion as to the relationship between *gracilis* and *gracillimus.* This can be done sufficiently carefully only through a comparison with at least the type material of *gracilis* which was not available to me. I can only state that *gracilis* and *gracillimus* are very closely related, but for the time being they must be regarded as separate species.

Differences between A. galatheae and gracillimus-gracilis

As mentioned above *galatheae, gracillimus,* and *gracilis* are all closely related, so closely that at any rate the two former – especially owing to the peculiar shape of the male pleotelson and the mandibles – ought perhaps to be placed in a genus or subgenus of their own. Considering the comparatively small material available and the great confusion in the systematics of the Apseudidae I have, however, omitted to do so for the present.

I regard the following characters by which *galatheae* differs from the two other species as the most essential and consider them of specific value: No bulbous processes at base of rostrum; transverse furrow across dorsal surface of carapax; much larger longitudinal keels on ventral side of pleotelson in male; stouter mandible and differently shaped pars incisiva and bunch of spines in both sexes; stouter chelipeds and a lateral process on its basis; differently shaped dactylus and claw on peraeopod V; lack of row of spines on propus of peraeopods VI and VII; S-curved peraeopod VII in male; differently shaped uropods, especially the peduncles in male.

2. NEOTANAIDAE

While working with the genus *Neotanais* I have kept in contact with Professor LANG who was engaged on similar studies. He recently (1956) published his results establishing the new family Neotanaidae, which is placed between Apseudidae and Paratanaidae-Tanaidae. I fully agree with LANG that the mouth-parts of both sexes of *Neotanais* are so peculiar that the knowledge of their nature justifies the establishment of a new family. LANG was only able to examine the mouth-parts of one species *(N. serratispinosus* Norman & Stebbing); my recently published study of six new species of *Neotanais* from abyssal areas (1956b) and the present paper show a remarkable uniformity in the shape of the mouth-parts, the antennulae, the antennae, etc. and thus serve to support the correctness of LANG's statement.

Concerning the relation between the undoubtedly primitive nature of this family and its distribution in the deep-sea only, I shall revert to this question in a later chapter (p. 235).

Besides the six recently described new species, *Neotanais* was known to comprise five species.[1] To

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1. *N. laevispinosus* Norman & Stebbing is the male of *N. serratispinosus* Norman & Stebbing. On the other hand, it is rather doubtful whether the two only known specimens of *N. americanus* (BEDDARD 1886b, p. 126), collected by the Challenger in the North and the South Atlantic, both belong to this species. According to BEDDARD they only differ in relative length of carapax and peraeonites. However, in

these is in this paper added one more subspecies. Moreover, it has been necessary to establish a new genus on another species, collected by the Galathea Expedition. Thus, the Neotanaidae now count altogether thirteen species and subspecies, twelve of which belong to *Neotanais* and one to *Herpotanais* n. gen.

Neotanais Beddard, 1886

Neotanais Beddard, 1886a, p. 117
Neotanais Beddard, 1886b, p. 124
Alaotanais Norman & Stebbing, 1886, p. 111
Alaotanais Norman & Stebbing, STEBBING 1893, p. 324
Neotanais Beddard, STEBBING, 1893, p. 324
Neotanais Beddard, LANG 1956, p. 469

The fact that LANG has recently described the mouthparts of *serratispinosus* (l.c.) and that seven new species and subspecies of *Neotanais* have now become known (WOLFF 1956b and the present paper) has enabled me to give below an adequate diagnosis of this very interesting genus. Besides, a diagnosis is called for owing to the establishment of another genus of Neotanaidae (see p. 218).

Diagnosis:

Female. Body elongate and narrow, of approximately the same diameter. Carapax pear-shaped and slightly projecting between the antennulae; eye-lobes present, but minute, suboval in shape and without visual elements. First five pleonites (pleon segments) subequal; pleotelson shield-shaped, ventrally rounded or with a subcarinate keel. Antennula with a three-jointed peduncle and a four-jointed flagellum. Antenna with a five-jointed peduncle and a four-jointed flagellum. Mandibles without palps, broad and strong, with two spines on left, three on right mandible and a stout molar process with toothed outer margin. Maxillula well developed, exterior endite with eight to ten spines, interior with three to four setae. Maxilla with the endites furnished with setae, and the fixed endite besides with bifid spines. Labium with an oblong, antero-lateral plate. Epignath of maxilliped strongly bent, with a tuft of setae distally and a ciliated lobe anteriorly. Cheliped very stout; fixed finger broad, with strongly toothed distal margin, movable finger slender. Peraeopods subequal, extremely spinous, and some of the spines more or less serrated; dactylus of peraeopods II-IV simple, of V-VII preferably with a distal collar of spinulets; distal end of propus of last pair of peraeopods with a comb of short spines. Pleopods well developed, setiferous. Uropod with a short peduncle; exopodite short, two-jointed, endopodite with at least eight elongate joints.

Male. Body as in female, but each peraeonite (peraeon segment) narrower in front, broader behind. Genital openings on two protuberances on a common convexity. Antennula and antenna more elongate than in female and the former with a tuft of aesthetes on a projection on the first joint of flagellum. Maxilla with two setiferous, more or less distinct, distal lobes. Palp on maxilliped slender. Cheliped rather different from that of the female, being more slender and with much longer fingers. Peraeopods with less serrated spines. Pleopods and uropod as in female.

Neotanais giganteus Hansen, 1913

Neotanais giganteus Hansen, 1913, p. 20, pl. 2, fig. 2a-2h.

In Davis Strait (61°50′N, 56°21′W) the Ingolf Expedition collected one magnificent male of this species at a depth of 2702 m and a bottom temperature of 1.5°C. HANSEN's description is excellent except for the fact that he does not mention the mouthparts. In order to study the relationship of the species of *Neotanais* I dissected the mouth-parts and describe them below. At the same time I include a few amendments to HANSEN's description of other features.

Carapax. The blunt rostrum has across its base a rather conspicuous furrow, also found in most other males of *Neotanais*. Apart from the stiff setae on the dorso-lateral keel there is one seta on the anterior vaulted area laterally.

Peraeonites evenly vaulted on the ventral side except the seventh which has a large convexity, crowned with two rounded tubercles, on the top of which the genital openings are visible (fig. 19a and LANG 1956, fig. C2).

Pleonites have on the ventral side an extended, low convexity with a rounded projection centrally which is split into two halves by a longitudinal cleft (fig. 19a).

Pleotelson (fig. 19b) with the uropods inserted on two conspicuous processes and posteriorly with sharp corners.

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the material of *N. serratispinosus hadalis* and *H. kirkegaardi* (described below) I have not found any variation whatsoever in this character. I have not had access to the two specimens, and it is to be hoped that they will soon be carefully studied after having been dismounted.

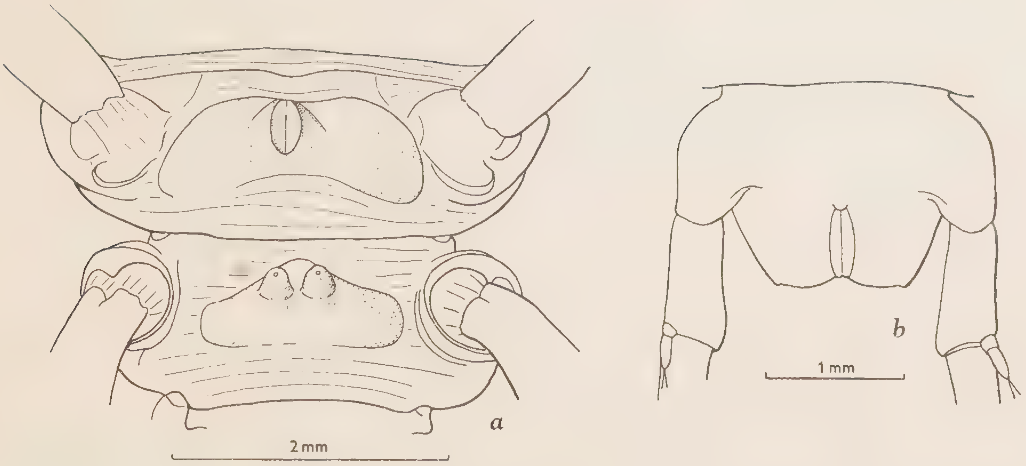

Fig. 19. *Neotanais giganteus* Hansen, ♂ type specimen; a, peraeonite 7 and pleonite 1 from below; b, pleotelson from below.

Antennula according to description, but HANSEN's fig. 2b on pl. 2 does not show that the enormous number of silky, sensory hairs emerge from a convexity covering the entire proximal two thirds of the first joint of the flagellum; the sensory hairs are thus not restricted to a rather limited projection as in the other males known.

Maxilla (fig. 20a) of the same type as in the males of the other species, but differs in having all the setae except two on the outer lobe of the movable endite inserted inside the margin of the lobes.

Maxilliped (fig. 20b) with a short first joint (with one seta) and a very broad second joint with which the endite is fused. The latter is bent somewhat upwards and the distal margin has one short seta on the further projecting part. The palp is very long, with many setae as shown in the figure. The fifth joint has more than twenty terminal setae. The epipodite (fig. 20c) is not so much bent as in *H. kirkegaardi* (fig. 42, p. 222). The basal part is larger and the setiferous distal part is s-curved.

Cheliped with one short, strong seta on the interior side of the hand at insertion of the movable finger, but only on right cheliped. Of the several setae found on the fixed and movable fingers in the males of the other species, only two minute setae are present in *giganteus* at the base of the two projections on the fixed finger.

Peraeopods show only a slight difference between the first three and last three pairs, viz. longer setae and shorter claws in the former. This corresponds to what is found in the other species, but *giganteus* has no row of spinulets on dactylus of peraeopod V-VII, and all setae are simple.

Pleopods resemble those of *serratispinosus hadalis* (fig. 29d), but the basal joint is longer and without setae, and the inner ramus is somewhat broader.

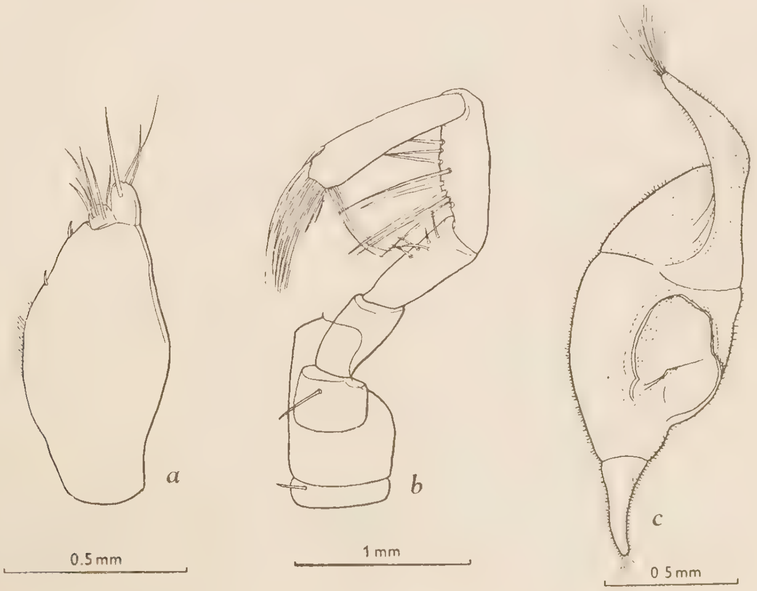

Fig. 20. *Neotanais giganteus*, ♂ type; a, left maxilla; b, left maxilliped; c, epignath of left maxilliped.

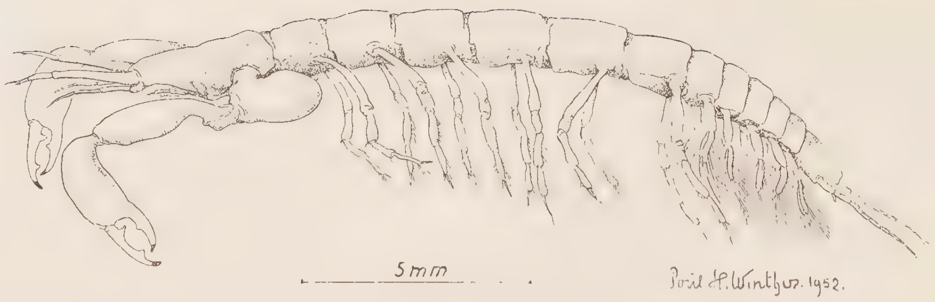

Fig. 21. *Neotanais serratispinosus hadalis* n. subsp., male A; the deepest recorded tanaid (Kermadec Trench, 8210 m).

Neotanais serratispinosus hadalis n. subsp.

Material:

St. 649, Kermadec Trench (35°16'S, 178°40'W), 8210 m, 14. Feb. 1952. Gear: 6 m sledge trawl. Bottom: grey clay with pumice. Bottom temperature: 1.5°C. – 2 adult females + 2 adult males.

St. 651, Kermadec Trench (32°10'S, 177°14'W), 7150 m, 16. Feb. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temp.: 1.3°C. – 1 fragment of a female.

The study of the five specimens from the greatest depths from where tanaids have so far been collected has caused me much trouble. As will appear from the descriptions given below they differ only sligthly from *N. serratispinosus* (Norman & Stebbing). With some hesitation I have therefore decided to regard them as belonging to a subspecies of *serratispinosus;* in the remarks on p. 217 I have discussed in detail the affinity of this new subspecies to *serratispinosus* and to a few other related species of *Neotonais.*

Description of female type:

Body (fig. 22a) only moderately elongate, being 7.3 times longer than broad. The integument is everywhere strongly calcified, giving the animal a very robust appearance. The colour is purely white.

Carapax only a little longer than broad; it is almost as long as peraeonites 2 and 3 together. The dorsal surface is rather vaulted and with a low, oblique furrow on each side, shown in fig. 22a. Anteriorly is a short, blunt rostrum, and at the outside base of the antennulae the small eye-lobes are clearly visible; in side view they appear oval and a little curved in shape, with straightly cut off base (cf. fig. 43a, p. 222). At the insertion of the chelipeds there is a conspicuous coxal plate. There are four slender setae on the anterior, vaulted area laterally.

Peraeonites (fig. 22a) equally wide; the longest is peraeonite 5, but 4 and 6 are almost as long, 3 is a little shorter, 7 the shortest but one, and 2 the shortest, being $^{3}/_{5}$ of peraeonite 5 and twice as broad as long. The shape of the peraeonites is almost quadrangular, and they are evenly rounded ventrally.

Pleonites (fig. 22a) resemble those in *serr. serratispinosus* and *affinis* (Wolff 1956b); they are short and broad and almost equally wide; ventrally they are evenly rounded.

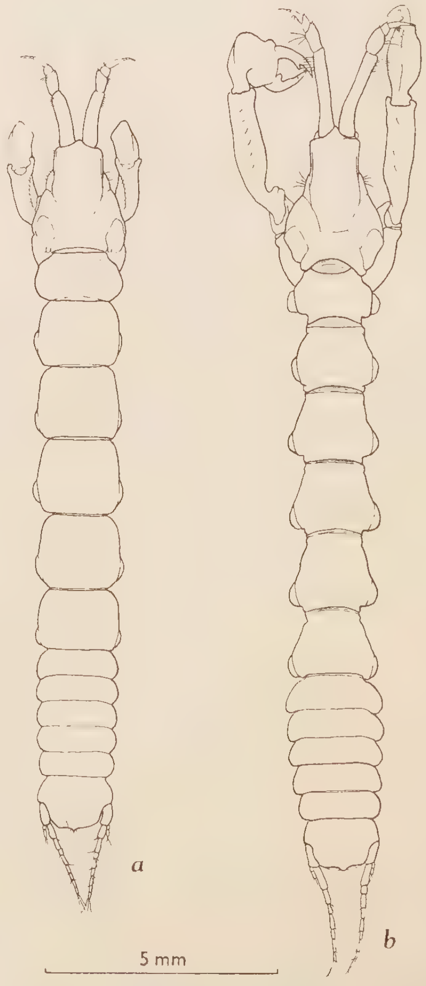

Fig. 22. *Neotanais serr. hadalis* n. subsp.; a, female type specimen; b, male A.

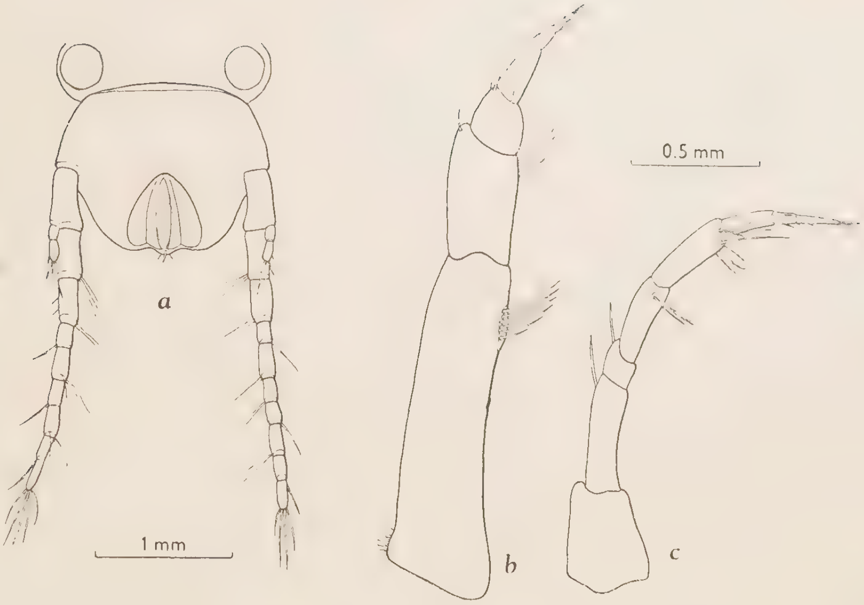

Fig. 23. *Neotanais serr. hadalis* n. subsp., ♀; a, pleotelson and uropods from below; b, right antennula from above; c, left antenna from below.

Pleotelson longer than the two preceding pleonites and 1.3-1.4 times broader than long. On the dorsal surface are a few very inconspicuous setae. The anal doors are not visible from above. They occupy a triangular area on the ventral side (fig. 23a) which is evenly rounded. The posterior projection is furnished with three short setae. The total length of pleon is a little greater than in *s. serratispinosus,* covering the combined lengths of peraeonites 7 and 6 + a little more than half of 5.

Antennula (fig. 23b). There are six horizontal setae on joint 1 and four on 2, besides five thin setae on the lower side of joint 2. The third joint is about as long as broad. The first joint of the flagellum is considerably longer than the three succeeding ones.

Antenna (fig. 23c) has joint 2 longer than 1, and besides the subterminal, stiff setae on joints 2, 3, and 5 there are a few thin, feathered setae on joints 4 and 5.

Labrum more tongue-shaped than in *H. kirkegaardi* (figs. 37b & 42f) and with a row of very short setae along the outer margin. The bulbous part smaller and with less developed lateral convexities.

Mandibles very broad and almost diamond-shaped in frontal view (fig. 24a), because they are furnished with a strong convexity on the anterior margin, thus

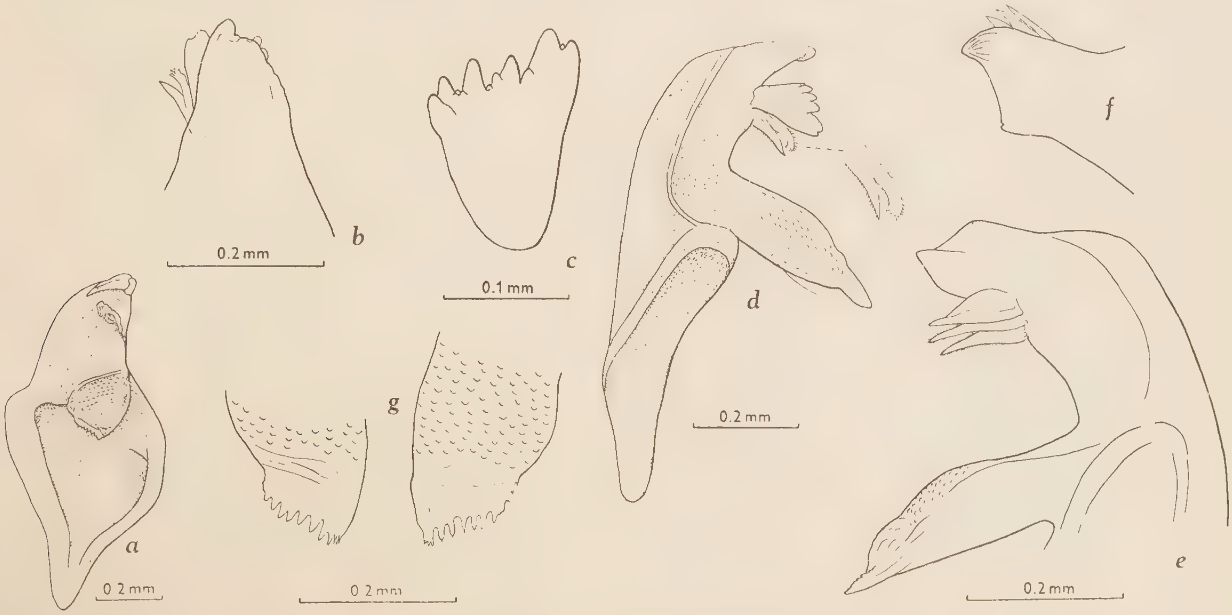

Fig. 24. *Neotanais serr. hadalis* n. subsp., ♀; a-d, left mandible; a, seen from inside; b, incisive part from outside; c, frontal view of movable lacinia; d, seen from the side; e-f, right mandible; e, seen from the side; f, incisive part from outside; g, outer margin of molar process of left and right mandibles.

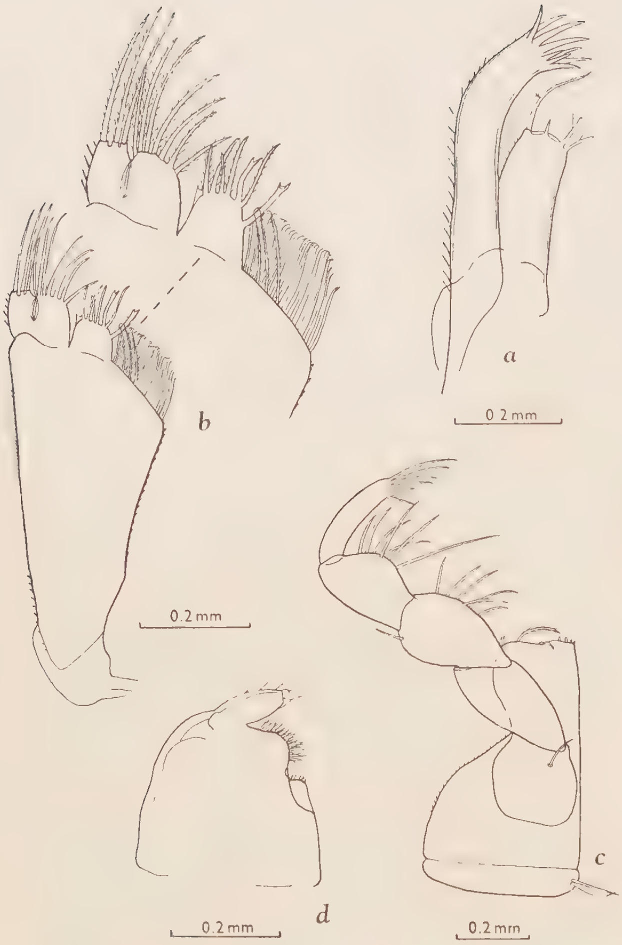

Fig. 25. *Neotanais serr. hadalis* n. subsp., ♀; a, right maxillula; b, right maxilla; c, right maxilliped; d, right side of labium.

augmenting the size of the cavity for insertion of the muscles. Pars incisiva of left mandible (fig. 24b) with one blunt tooth. There are five teeth of varying size in the movable lacinia (c). Both spines in the spine-row with tiny hairs (d). The molar process is almost triangular in section (a) and its surface is rough with small nodules. The right mandible (e & f) has a rather pointed tooth on the otherwise almost straight incisive part; of the three translucent spines the innermost is pointed and broad, looking very much the same as the apodemes of for instance a lobster. The other two spines with short hairs. The lower distal margins of the molar processes are peculiarly serrated and not quite equal (g).

Maxillula (fig. 25a) has four setae on the internal endite; the three short ones are not feathered and two of them have one minute seta on the exterior side (difficult to see). Both the interior and exterior endites have fine hairs along the outer margin. No palp could be found.

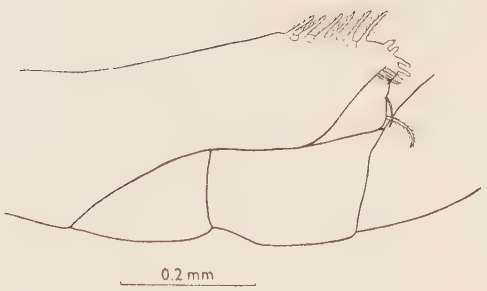

Fig. 26. *Neotanais serr. hadalis* n. subsp., ♀, left maxilliped; oblique view of attachment-plane, upper and anterior margin of endite and three first joints of palp.

Maxilla (fig. 25b) with the fixed lobe furnished with two forked spines and five setae; all the setae on the maxilla are very minutely feathered (only visible at great magnification). The distal part of the inner margin and the proximal part of the outer with small denticles and the outer margin besides with fine hairs.

Labium (fig. 25d) has two interior, rounded convexities on each side, both with short, closely set hairs. Distally on the antero-lateral plates are two peculiarly shaped setae.

Maxilliped (fig. 25c) with the first joint of the basal part very short and furnished with two very long and closely set setae. On the distal margin of the endite there are one feathered and one simple, downward bent seta and four short, stout spines at the inner corner, where there is also a tuft of delicate hairs (fig. 26). The inner margin of basis and endite is bent at right angles to the surface, thus forming a smooth attachment-plane against the other max-

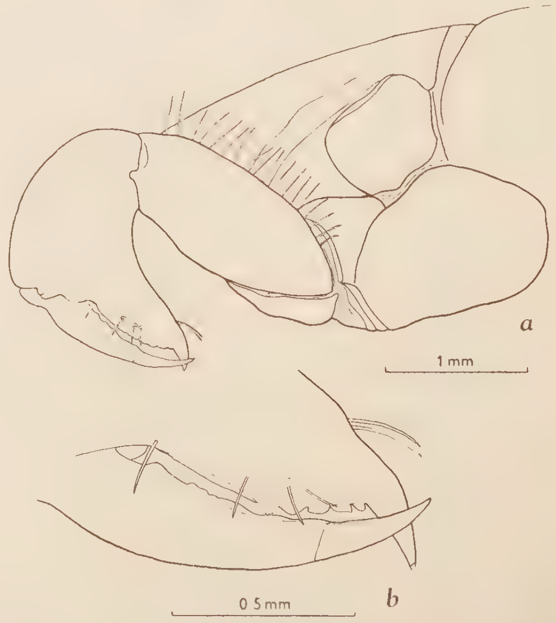

Fig. 27. *Neotanais serr. hadalis* n. subsp., ♀; a, left cheliped from the side; b, cutting edge of fingers.

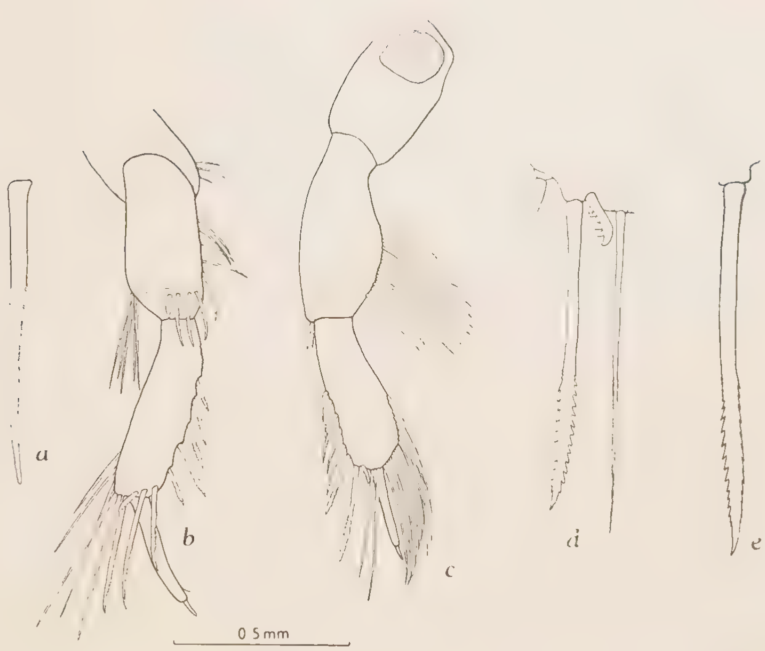

Fig. 28. a, *Neotanais serr. serratispinosus* (Norman & Stebbing); spine on peraeopod V of ♀ from Ingolf St. 22; b-d, *N. serr. hadalis* n. subsp., ♀; b, right peraeopod II, seen from the interior side; c, left peraeopod III from the anterior side; d-e, terminal spines on propus of peraeopods III and V, much enlarged.

illiped. Along the distal end of the upper margin of this plane are six feathered setae (fig. 26). The armament with setae on the palp is shown in fig. 25c. The epignath is completely like that of *H. kirkegaardi* (fig. 42c-e).

Cheliped (fig. 27a) almost as in *N. s. serratispinosus, barfoedi,* and *pfaffi;* in all these forms the hand is exactly twice as long as broad. Carpus with a conspicuous row of setae. The inner half of the cutting edge of the fixed finger with very fine denticles (fig. 27b), the outer with five irregular, blunt teeth. On the movable finger the low convexities along the inner margin are irregular.

Peraeopod II (fig. 28b) has nine rather long spines on the interior side of carpus; four of them are subterminal and serrated, and one of these only half as long as the remaining ones. There are eight slender spines with very few scattered hairs exteriorly. Propus has five interior and three long terminal spines, all of which are strongly serrated. Furthermore, there is a short, comb-shaped spine terminally, and five long and slender spines without serra-

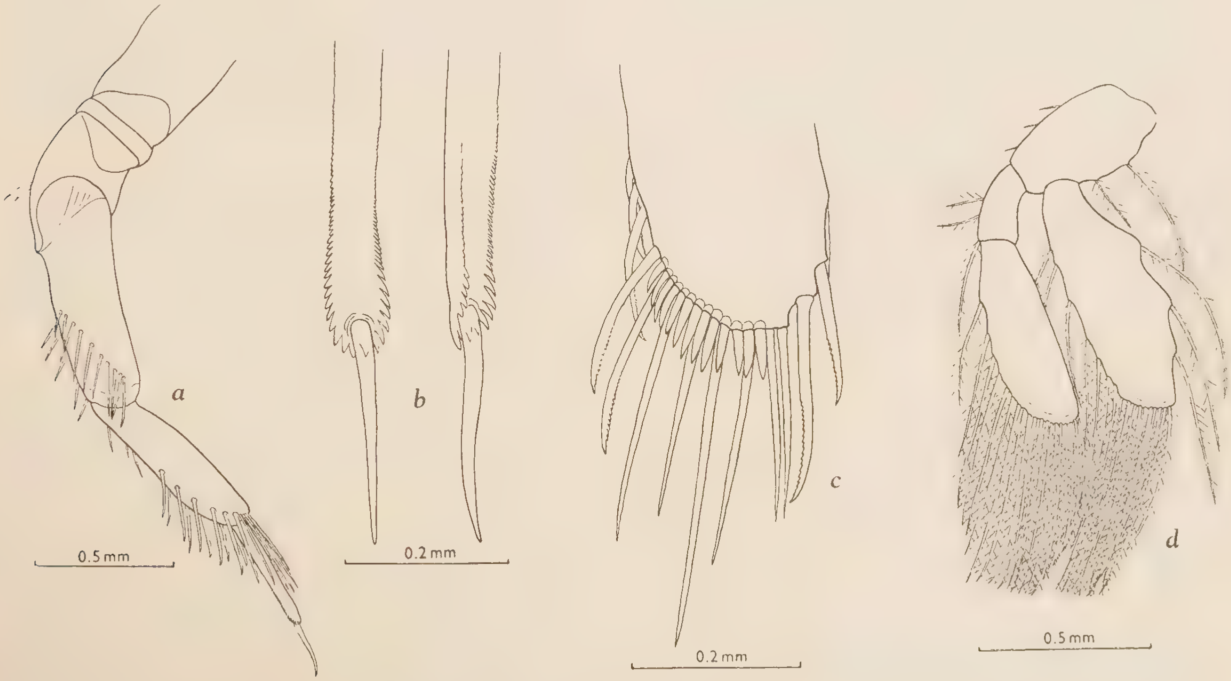

Fig. 29. *Neotanais serr. hadalis* n. subsp., ♀; a, left peraeopod V obliquely from outside; b, dactylus and claw of peraeopod V; c, end of propus of right peraeopod VII from behind; d, right pleopod 5.

tion along the exterior margin. On the proximal, inner margin of propus is a row of small denticles. The claw is very short, being less than one fifth of dactylus in this and the two following peraeopods.

Peraeopod III (fig. 28c) has merus considerably shorter than in II, but carpus and especially propus are longer (in fig. 28c propus is viewed under an oblique angle so that it appears shorter than in peraeopod II). There are eight rather short, serrated spines in one oblique row on the interior-posterior side of carpus (not visible in 28c) and twelve long, slender spines on the exterior margin. Propus has altogether ten stout, strongly serrated spines along the inner margin, one short comb-shaped spine with six teeth, and next to it two long, slender spines which are extremely finely serrated (only visible at very high magnification – fig. 28d). Then follows a row of twelve closely set, long, slender spines along the outer margin.

Peraeopod IV only differs from III in having no less than ten serrated, inner spines and fifteen outer, forming one very long, u-shaped row.

Peraeopods V-VII have the serrated spines almost as strongly serrated as in peraeopods II-IV (fig. 28e), and thus considerably more serrated than in *s. serratispinosus* (fig. 28a). The armament on carpus and propus of V-VII is shown in fig. 29a. There are six non-serrated spines terminally on propus and they are rather short. The spinulets on dactylus are exactly as in *s. serratispinosus* (NORMAN & STEBBING 1886, pl. 23, I prp. 4), but the claw is comparatively shorter and not serrated (29b). Along the distal end of propus in VII is a row of very short and closely set spines (c), almost like a finely toothed comb.

Pleopods (fig. 29d) of the same shape as in *s. serratispinosus,* but with considerably more plumose setae (the two figures of pleopods on plate 23 in NORMAN & STEBBING 1886 are incorrect).

Uropod (fig. 23a) rather stout, $^{2}/_{3}$ as long as pleon and with the exopodite $^{2}/_{3}$ of the length of joint 1 of the endopodite.

Description of male (A):

Only *differences* between this male and the female type are mentioned below.

Carapax (fig. 22b) differs greatly. It is more elongate (1.5 times longer than broad), primarily owing to the considerably long, flattened front part. The posterior margin is strongly concave. The two anterior, oblique furrows are connected posteriorly by a transverse furrow from which two diverging furrows run to the postero-lateral corners of the carapax. Finally, there is an inconspicuous furrow across the base of rostrum.

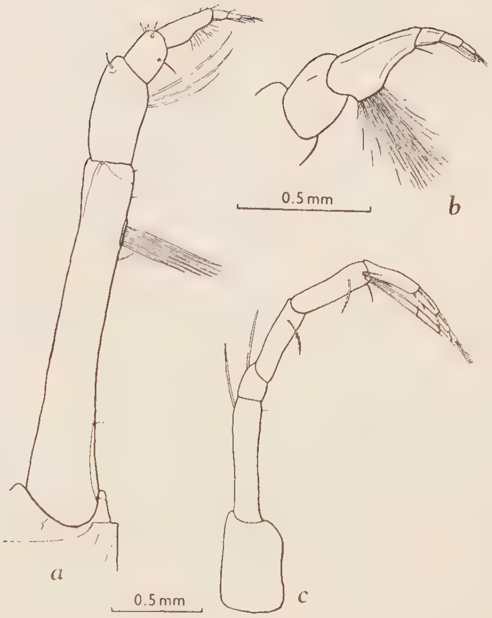

Fig. 30. *Neotanais serr. hadalis* n. subsp., ♂ A; a, right antennula from above; b, lateral view of flagellum; c, right antenna from below.

Peraeonites (fig. 22b) narrower in front and with a strong convexity at the insertion of the peraeopods. Peraeonite 2 relatively longer than in female. Especially the anterior peraeonites somewhat excavated in front. The genital openings on peraeonite 7 are found on two low protuberances on a common convexity near the posterior margin.

Pleonites (fig. 22b) decreasing in width from the first to the fifth and the posterior margin becoming less concave. The first segment is a little longer than the rest.

Pleotelson with no setae dorsally and on the posterior projection. Ventrally, it has anus totally calcified and only marked as a longitudinal furrow as in *giganteus* (fig. 19b), but reaching forward half way to the anterior margin. From the anterior margin to the front end of the anal furrow is a low, median impression.

Antennula (fig. 30a) much more slender and with longer horizontal setae. On the underside of the first joint of flagellum there is a rather insignificant projection with not very many, but rather stout aesthetes (fig. 30b).

Antenna (fig. 30c) only a little more slender than in the female, especially joint 1 (which is rather compressed) and joint 2. There is only one, sligthly feathered, ("auditory") seta on joint 4 and 5; the latter joint has some very long setae distally.

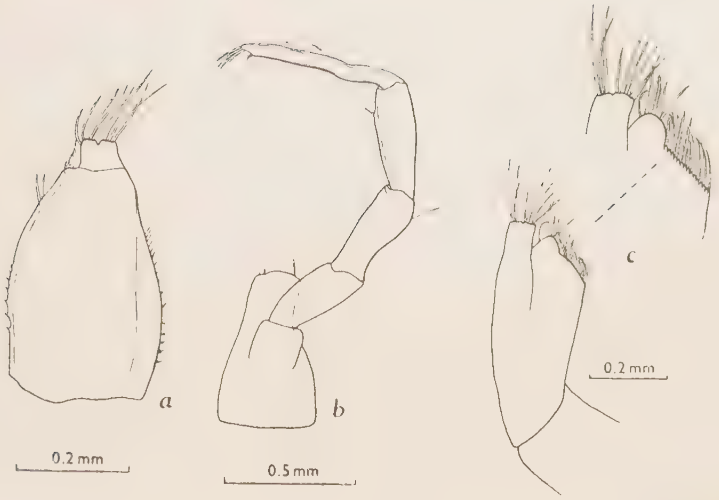

Fig. 31. *Neotanais serr. hadalis* n. subsp.; a-b, male A; a, left maxilla; b, left maxilliped; c, right maxilla of male B.

Mandibles reduced and totally fused with the buccal frame (cf. fig. 43, p. 222). *Maxillula* not developed.

Maxilla (fig. 31 a) rather different from that of the other species in which it was described. It has two equally long, distal lobes, the outer with three and the inner with five setae, a low inner projection with two or three setae and two more, inner setae further proximally.

Maxilliped (fig. 31 b) with the first short joint fused with the buccal frame. The somewhat convex distal margin of the endite has one seta near the outer and one or two minute spines near the inner corner. The palp is much more slender than in the female and in most other males of *Neotanais* and with only a few, short setae; especially the fifth joint is very elongate. Epignath as in female.

Cheliped (figs. 21 and 32 a) much longer and more slender than in female. Hand almost three times longer than broad and very much like that in *s. serratispinosus,* but more vaulted along the proximal-exterior margin, and the keel on the exterior margin is much less serrated. The fixed finger differs in having the stout, distal process in *s. serratispinosus* (NORMAN & STEBBING 1886, pl. 24, II gn.) substituted by four low, distally decreasing protuberances.

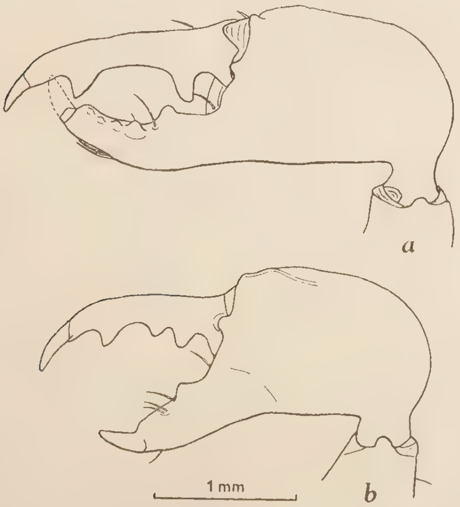

Fig. 32. *Neotanais serr. hadalis* n. subsp., ♂, hand of left cheliped from outside; a, of male A; b, of male B.

Peraeopods with the same shape and almost the same armament with spines as in the female. There are the following major differences: The very short, terminal spine on propus of peraeopods II-IV, which is comb-shaped in the female, is simple; the long and non-serrated spines on the exterior margin of carpus and propus of III and IV (fig. 28 c) are considerably shorter and feebly serrated in the male,[1] thus resembling those of the interior row of the joint, all the more since the interior spines are not so serrated as in female; nor is the difference between the lateral and terminal spines of V-VII so great as in the female, the terminal spines are shorter, the claw is shorter, and the collar of spinulets on dactylus is minute; the comb of very short spines along the distal margin of propus of peraeopod VII is almost invisible.

Sice:

The female type is 15.0 mm long and 2.0 mm broad across carapax. The above described male (A) is 15.7 mm long and 2.1 mm broad; the other female from St. 649 is 15.1 mm long, the other male (B) is 15.5 mm; the female from St. 651 is about 9 mm long.

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[1] When light is transmitted, under high power, the outer end appears to be covered with minute prickles – as described for *N. hastiger* by NORMAN & STEBBING (1886, p. 113).

Variation in adult females:

The two females from St. 649 are practically identical. A careful examination shows that the other female varies from the type in the following respects: Antennula with only three horizontal setae on joint 2; the two spines in the spine-row of left mandible are as long as the movable lacinia, the larger is only slightly curved, and the smaller not so pointed; margin of pars molaris equal in left and right mandibles and almost corresponding to that of left mandible of the type (fig. 24 g); in maxillula the two setae on the interior endite have no visible setae on the outer side and one of the spines on the exterior endite of right maxillula is subterminal (fig. 33; this is, however, no doubt an abnormality); armament of maxillae equal in the two specimens, but the margins are more parallel, and the fixed endite more projecting in the female, which is not the type; finally, it has only five feathered setae on the upper margin of the attachment-plane of the maxillipeds. No other differences could be found.

From St. 651 is a fragment only of a female, so nothing definite can be said of the position of this specimen. It probably belongs to this subspecies, counting from the shape of body and of the five pairs of peraeopods present. However, it differs in one respect: The uropods are considerably longer (almost as long as pleon as against less than $^{2}/_{3}$ as long as pleon in the type), with the exopodite only a little shorter than the first joint of the endopodite.

Variation in adult males:

As in *Apseudes galatheae* and *A. gracillimus* (p. 206) there is an even transition in many of the characters normally distinguishing males and females. The other male (B) of *serratispinosus hadalis* from St. 649 shows a remarkable mixture of female (♀) and male (♂) characters, as shown in the following survey:

Carapax broad and flattened (♂), but with the transverse furrow only feebly indicated. – *Peraeonites* almost square (♀), only the corners a little more rounded and the segments more vaulted; ventrally on peraeonite 7 a convexity with the genital openings on two low protuberances (♂). – *Pleonites* half way between ♀ and ♂. – *Pleotelson* with short setae posteriorly (♀) and on the ventral side with a big, uncalcified anal face (♀), but the cleft-shaped anal opening is apparently substituted by a small round hole; an inconspicuous median furrow towards the anterior margin of pleotelson (♂).

Antennula with the first two joints half way between ♀ and ♂ (there are seven and three horizontal setae), but the flagellum is exactly as in male A. – *Antenna* half way between ♀ and ♂.

Mandibles show a remarkable transition from the highly specialized mandibles of the female to the calcified rudiments totally fused with the body wall, found in male A. Left mandible is broader and shorter than in ♀ (fig. 34 a) and perfectly excavated interiorly. There is no molar process but only a rounded ridge, and in the outer surface a deep, broad, almost transverse furrow (fig. 34 b). Distally, the mandible has a rounded process and two translucent spines (a-c). The right mandible (d) is less modified; the incisive part is present and shaped as in ♀, although narrower; the three translucent spines are well developed, but the two narrow ones are only furnished with a few short hairs and the broad one is bifid. The molar process is present but rudimentary, and the lower, distal margin is quite different (e). There is the same broad exterior furrow as in the left mandible (d).

Maxillula not developed. – *Maxilla* (fig. 31 c) also

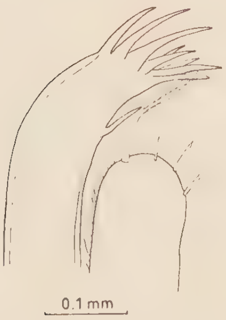

Fig. 33. *Neotanais serr. hadalis* n. subsp.; outer end of maxillula of the other female from St. 649.

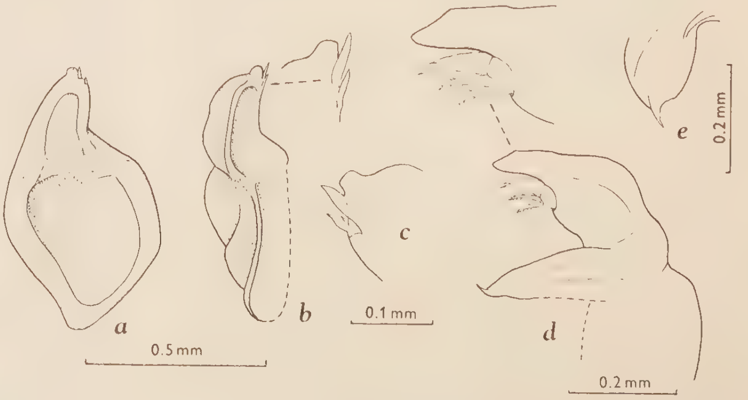

Fig. 34. *Neotanais serr. hadalis* n. subsp.; mandibles of male B; a-c, left mandible; a, seen from inside; b, lateral view; c, apex obliquely from outside; d-e, right mandible; d, lateral view; e, distal margin of molar process.

exhibits an interesting transition between ♀ and ♂ maxillae. The two lobes of the movable endite are fused and have three and six setae respectively. The fixed, rather insignificant endite has no forked spines but five setae of varying thickness. – *Maxilliped* very close to that of ♀, but the joints of the palp are a little more elongate (especially joint 5) and there is one seta less on joints 3 and 4.

Cheliped (fig. 32b) of the same type as in male A, but differs in the following respects: Proximal part of hand broader and more vaulted, the keel on the exterior margin not serrated and entering for a short distance the outer surface of the hand; fixed finger much shorter and with no protuberances distally, but with more setae; movable finger somewhat shorter and with one more triangular process.

Peraeopods also between ♀ and ♂: The short terminal spine on II-IV is finely combed, the non-serrated spines found in ♀ are all minutely serrated, an extremely fine comb of short spines distally on dactylus of VII, etc.

The question of possible hermaphroditism in this and other species of *Neotanais* will be discussed in the following chapter (p. 230).

Remarks:

As pointed out above the similarities between the species *N. serratispinosus* (Norman & Stebbing) and the five specimens from the Galathea are so striking that I chose to refer the specimens to a subspecies of *serratispinosus*. Of the latter species there only exist a few specimens from Norman & Stebbing's collection (including the male type and only individual of *laevispinosus*, which Lang (1956) transferred to *serratispinosus)*. These specimens are kept in the British Museum (Nat. Hist.), London, and in Oxford, and unfortunately I have not had access to any of them; however, Professor Lang has kindly answered various questions relating to these specimens, while he still had them on loan from London. Moreover, we have in this Museum the mature female of *serratispinosus* from the Ingolf Expedition (Hansen 1913, p. 18), and besides the species is well described and figured by Norman & Stebbing (1886) and Lang (1956).

Based on these various sources I have undertaken a very careful comparison, which showed a striking similarity in all major features. Before pointing out the differences which in my opinion justify the separation in two subspecies I shall mention several features which are probably all non-specific, because variation is found between the Norman & Stebbing and the Ingolf specimens or within the same organs in *H. kirkegaardi* of which a large material was collected by the Galathea, and thus made possible a study of the variation. In the following "N. & S." refers to one or more specimens from Norman & Stebbing's collection (according to literature or verbal information from Professor Lang), "Ing." refers to the mature specimen from the Ingolf Expedition and kept in this Museum, and "*had.*" to the type specimen and male A from the Galathea Expedition.

Females. *Length/width of body:* N. & S. and *had.* 7.3, Ing. 10.3 times longer than broad. – *Ventral side of body:* Evenly rounded in N. & S. and *had.*, with a low subcarinate keel in Ing. – *Length/width of joints of peduncle of antennula:* According to my fig. 23b and Lang's fig. A 1 (1956) greatly different but another specimen from N. & S.' collection shows the same proportions as in fig. 23b. – *Largest tooth on movable lacinia of left mandible:* Considerably more projecting in N. & S. (Lang's fig. A 7) than in *had.* (my fig. 24c), but the mov. lac. of Ing. is practically identical with that of *had.* – *Spines in left mandible:* Equally shaped in N. & S. and Ing., but in the latter without the short hairs; *spines in right mandible:* Equally shaped in *had.* and Ing., but in the latter without hairs; in *H. kirkegaardi* I have found a great variation in the shape and furnishment with hairs on the mandibular spines. – *Pars incisiva of right mand.:* Identical in N. & S. and Ing. and different from *had.* (24e), but individuals of *kirkegaardi* show a similar variation. – *The short setae of inner endite of maxillula:* Not feathered in Ing. – *Fixed endite of maxilla:* Three bifid spines in N. & S., two only in *had.* and Ing.; three feathered and one unfeathered seta in the latter specimen. – *Armament with spines and setae on endite of maxilliped:* Identical in *had.* and Ing.

I shall then turn to the *differences* between the N. & S. and Ingolf specimens on one side and the Galathea specimens on the other. According to my knowledge of variation in Neotanaidae, based on the study of altogether eight species, I consider these differences, slight as they are, sufficiently stable and significant to justify the separation of the above named specimens in two subspecies. The differences are:

Females.

(1) Peraeonite 2 two times broader than long in *serr. hadalis,* three times broader than long in *serr. serratispinosus*.

(2) Labium of *s. had.* with two distinct, setiferous, inner convexities (fig. 25d), of *s. serr.* with one only (LANG's fig. A 11).

(3) Number of serrated spines on all peraepods considerably larger in *s. had.*

(4) Peraeopods V-VII with much more strongly serrated spines in *s. had.* (fig. 28 e) than in *s. serr.* (28a).

(5) A row of thirteen short spines terminally on propus of peraeopod VII in *s. had.*, nine only in *s. serr.*

(6) Uropoda in *s. serr.* very slender (NORMANN & STEBBING 1886, pl. 24, I D) and as long as pleon, in *s. had.* (from St. 649) twice as stout and at most $^2/_3$ of pleon.

(7) Total length of fully developed females and males: ♀♀ of *s. had.* 15-15.1 mm., ♂ 15.7 mm; ♀♀ of *s. serr.* 6.7-8.5 mm, ♂ 5.5 mm.

Males.

(8) Collar of spinulets on dactylus of peraeopods V-VII in males of *s. had.* considerably weaker than in females, in *s. serr.* as strong as in females (LANG's fig. B 3).

Also the shape and armament of the male maxilla differs (my fig. 31 a and LANG's fig. B 2), but owing to the scarcity of males not only of the present subspecies, but also of other species of *Neotonais* I have not been able to study the variation in male maxillae.

The above named differences should perhaps also involve that the Ingolf specimen of *serr. serratispinosus* was separated from the NORMAN & STEBBING specimens as a new subspecies. Having, however, not had access to the latter type material I have not found it possible to consider this question sufficiently carefully.

It was very astonishing to find *N. serratispinosus hadalis* from the S.W. Pacific and from the greatest depths (8200 m) to be almost identical with a species occurring in the North Atlantic and at moderate depths (700-3500 m). Perhaps the most striking fact is that the only male known of *serr. serratispinosus* has been dredged at a bottom temperature of about 10°C., while neither *serr. hadalis* nor any of the other ten species of *Neotanais* have ever been found at temperatures exceeding 3.3°C. (see discussion on p. 232). This fact seems to indicate that what I have called two different subspecies are probably physiologically separate species, but no morphological features known to me allow a separation.

N. serr. hadalis resembles *robustus* in shape of the mandibles and *barfoedi* in armament of the peraeopods (WOLFF 1956b). Both these species were also collected in the Kermadec Trench (at 4400-4600 m and at 2500-2600 m).

Distribution:

N. serr. hadalis is known only from the Kermadec Trench N.E. of New Zealand from a depth of 7150-8210 m (thus being the deepest recorded tanaid) and from temperatures of 1.3 – 1.5°C.

Herpotanais[1] n. gen.

Diagnosis:

Female. Carapax as in *Neotanais,* but peraeonites and pleonites more elongate. Pleotelson with depressions ventrally. Antennula and antenna stouter than in *Neotanais,* and the former with a five-jointed flagellum. Mouth-parts as in *Neotanais,* except that the spines on the fixed endite of maxilla have a more complex shape. Appendages almost corresponding to those of *Neotanais,* but no comb of short spines on the distal end of propus of peraeopod VII. Pleopods reduced, with two short joints and a few short setae. Uropod with a very long, stout peduncle; exopodite very short, endopodite with at most six, rather stout joints.

Male. Genital openings interiorly on two short, longitudinal keels. Pleotelson with a depression ventrally. Antennula has a five-jointed flagellum, but is more elongate than in female; first joint of flagellum very large, with a distal projection furnished with aesthetes. Antenna with nine joints as in female, but more slender. Maxilla and maxilliped rather much as in *Neotanais.* Cheliped not much differing from that of the female, either in slenderness or in length or armament with teeth on the fingers. Peraeopods, pleopods and uropod almost as in female.

Remarks:

Even if this genus is very closely related to *Neotanais,* the totally different arrangement of the male genital openings, the number of joints in the flagellum of the antennulae, the differently shaped uropods, and the reduction of the pleopods in *Herpotanais* clearly separates it from *Neotanais.* The presence of reduced pleopods in both sexes is surprising, and as far as I know this is the first instance of reduction of the *male* pleopods in Tanaidacea.

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[1] From ἕρπω, creep.

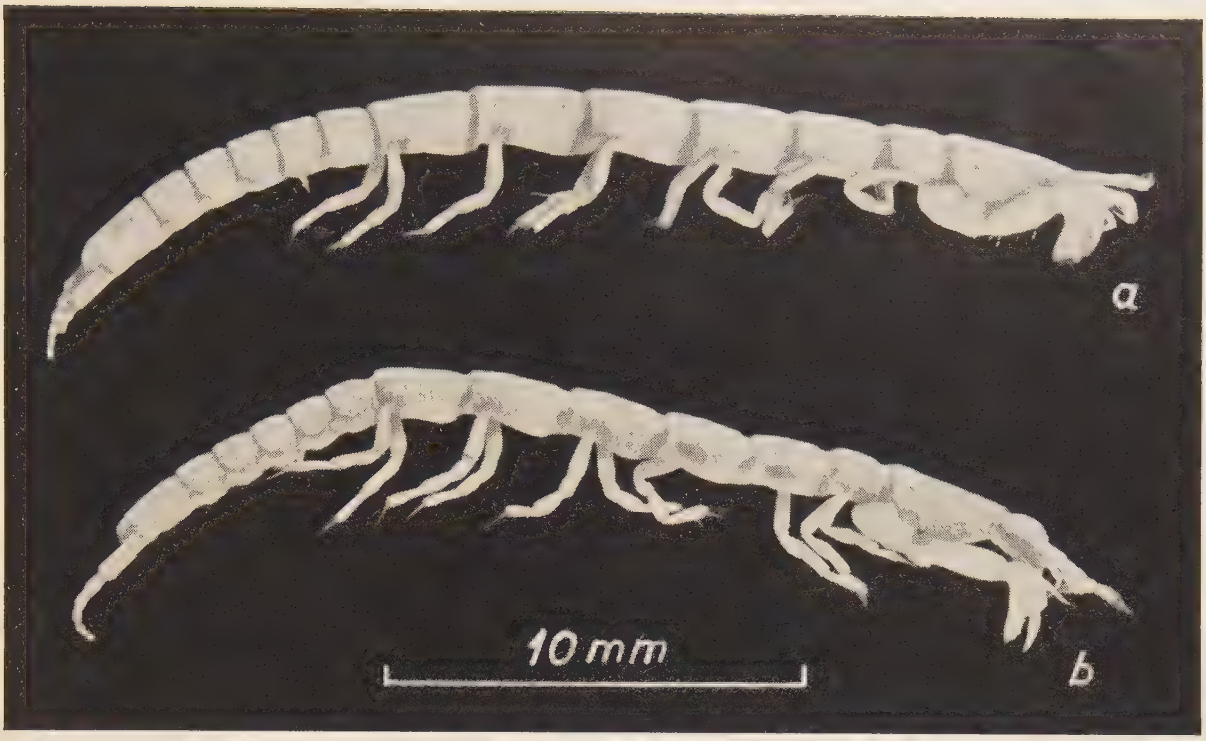

Fig. 35. *Herpotanais kirkegaardi* n. gen., n. sp. from the Kermadec Trench, 7150 m; a, female type specimen; b, male Z. H. V. CHRISTENSEN phot.

Herpotanais kirkegaardi n. sp.

Material:

St. 651, Kermadec Trench (32°10′S, 177°14′W), 7150 m, 16. Feb. 1952. Gear: herring otter trawl. Bottom: brown clay with pumice. Bottom temperature: 1.3°C. – 19 adult females (complete) + 3 incomplete females; 4 adult males (complete), + 2 incomplete males; 11 preadult specimens; in all 39 specimens.

Description of female type:

Body (figs. 35a and 36a) extremely elongate, being 10.7 times longer than broad. It is smooth both dorsally and ventrally, with no spines and only a few minute hairs. Colour of integument purely white as in *N. serr. hadalis*.

Carapax pear-shaped, 1.3 times longer than broad. It is as long as peraeonite 2 and half of 3. The two oblique furrows on the dorsal surface, the eye-lobes and the coxal plates as in *N. s. hadalis* (fig. 43a).

Peraeonites of nearly the same width, except the seventh which is a little narrower. Peraeonite 6 is the longest, 4, 5, and 7 are equally long, 3 somewhat shorter and 2 only a little more than half as long as 6. The shape is almost rectangular with rounded corners and a convexity at the insertion of the legs. Peraeonite 2 has a transverse excavation in front.

Pleonites (figs. 35 a and 36 a) are equal in size and shape, apart from the fact that 1 and 5 are a little longer than the rest and have a lateral impression at the anterior and posterior end, respectively. On the lateral convexities at the insertion of the pleopods there are 1-3 short setae with scattered, fine hairs.

Pleotelson almost twice as long as each pleonite, with slightly divergent lateral margins to at the insertion of the uropods. Beyond these there is a strongly vaulted projection with the anal opening terminally. The posterior margin is dorsally slightly concave with a minute central pro-

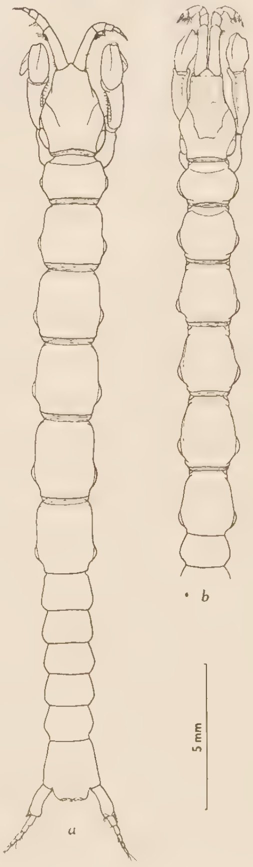

Fig. 36. *Herpotanais kirkegaardi* n. sp.; a, female type; b, male Z.

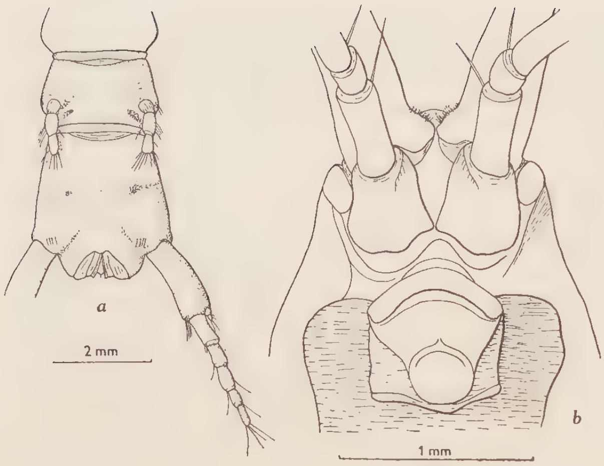

Fig. 37. *Herpotanais kirkegaardi* n. sp., ♀; a, pleonite 5, pleotelson and uropods from below; b, base of antennulae and antennae, labrum and mouth cavity from below.

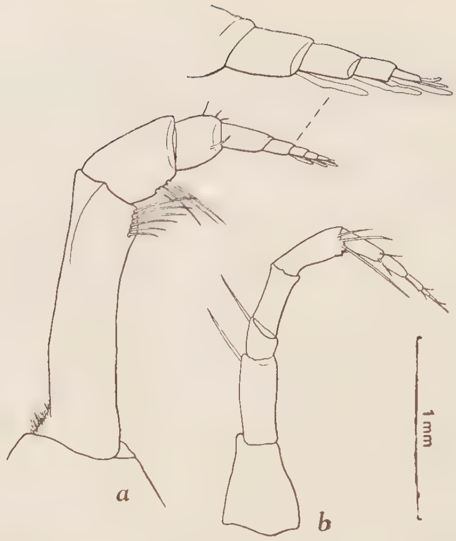

Fig. 38. *Herpotanais kirkegaardi* n. sp., ♀; a, right antennula from above; b, left antenna from below.

jection, furnished with a very short seta. On the ventral side (fig. 37a) the posterior margin of the projection is strongly concave so that the anal doors are clearly visible. The ventral surface of pleotelson has a pair of circular depressions between the anterior margin and the insertion of the uropods; near the latter is a row of four short setae.

The total length of pleon is like that of peraeonites 5-7 combined.

Antennula (fig. 38a) has the first joint slightly curved; it is somewhat swollen at the base and with short and fine, closely set hairs interiorly. There is a row of six long, stiff horizontal setae near the distal, outer corner. Joint 2 about one third of 1 and comparatively shorter than in *N. s. hadalis;* it has two long and two shorter setae on the outer margin and four much thinner and somewhat shorter setae on the lower side. Joint 3 half as long as 2 and about as long as broad. It has a strong, curved seta near the distal, outer corner and a couple of small setae. The first joint of the flagellum is almost as long as the four succeeding ones; each of the latter with one terminal, olfactory hair except the last joint which bears two short setae.

Antenna is inserted directly below and posterior to the antennula (fig. 37b). It is much stouter and also comparatively longer than in the species of *Neotanais* (fig. 38b). The second joint is even shorter than the conical first one and only $2^1/_2$ times as long as broad. This and the following joint have a long,

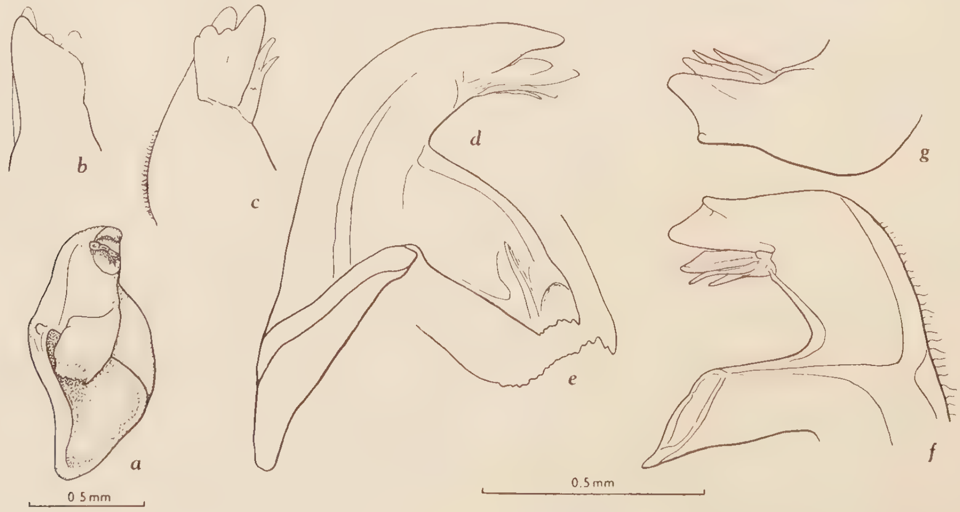

Fig. 39. *Herpotanais kirkegaardi* n. sp., ♀; a-e, left mandible; a, from inside; b, cutting edge from outside; c, frontal view of movable lacinia; d, from anterior side; e, distal margin of molar process from above; f-g, right mandible; f, from anterior side; g, cutting edge.

stiff, subterminal seta directed obliquely forwards and upwards. Joint 4 and 5 subequal and like 2, but a little shorter and narrower; joint 5 with three long setae on the distal, ventral side. There are five joints in the flagellum of the left antenna, and the usual four in the right. There are two short setae terminally.

Labrum strongly projecting, forming a bulbous closure of the front part of the oral cavity (fig. 42f). Seen from below (fig. 37b) the anterior "lip" shows its rounded terminal end, and the bulbous part has two lateral convexities which give it an almost quadrangular appearance.

Mandibles short and very thick in frontal view (fig. 39a). Pars incisiva of left mandible (39b) with one blunt tooth which does not project so much as the largest of the blunt teeth on the movable lacinia. Besides the large tooth, the latter has three more teeth, two of which are, however, rather inconspicuous (c). The spine-row counts two short and simple, translucent spines without hairs on the margins. The molar process is stout and has the end obliquely cut off and irregularly serrated along the lower margin (d-e). The right mandible differs in having a conspicuous denticle on the incisive part which makes it almost chisel-shaped (g); the spine-row consists of two simple, hairless spines and a broad spine as in *Neotanais* (f).

Maxillula (fig. 40a) with a well developed internal endite which distally is furnished with three short and a long seta, the latter with fine hairs near the tip. Proximally on the inner margin is one rather long seta and there is a row of fine hairs along the outer margin. External endite with a crown of ten spines. I was not able to find any palp which may be missing in this species.

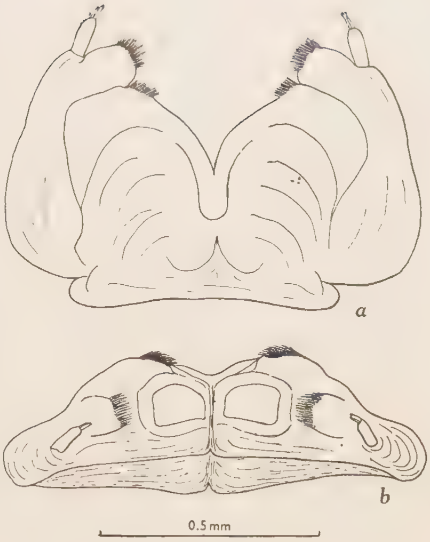

Fig. 41. *Herpotanais kirkegaardi* n. sp., ♀; labium; a, frontal view; b, from the anterior edge.

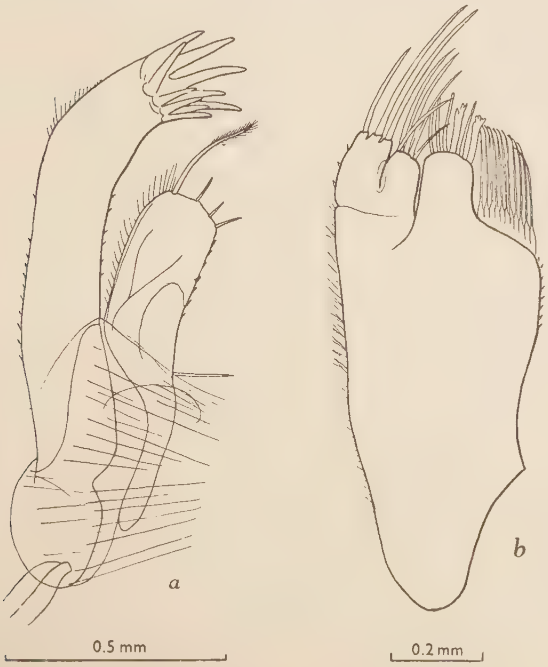

Fig. 40. *Herpotanais kirkegaardi* n. sp., ♀; a, right maxillula; b, right maxilla.

Maxilla (fig. 40b) is rather longish, with small denticles on the distal part of the inner margin and fine setae and denticles on the outer. The two lobes of the movable endite have three and five unfeathered setae, respectively. On the fixed endite are three to four simple setae and two stout, furcated spines which are rather unlike the bifid spines found in *Neotanais* (fig. 51 a, p. 228). There are eleven setae in the inner row.

Labium (fig. 41 a-b) almost as in *N. s. hadalis;* when seen from the edge it shows an extraordinary thickness (fig. 41b).

Maxilliped (fig. 42a) with two joints in the basal part; the proximal is very short, the second almost quadrate and totally fused with the endite and at the same time firmly attached to the corresponding joint of the other maxilliped. Near the outer, distal corner of the endite is a single, short seta, and on the inner corner two tiny processes and three short, oblique spines (42b). The upper margin of the attachment-plane has three feathered setae on each maxilliped. The palp with five stout joints armoured with setae (a) and with fine hairs which give the whole palp a somewhat "woolly" appearance. The epignath (c-e) curved at an angle of 90°, with a dense tuft of fine setae distally, but with no distinct lobe anteriorly as in *N. s. serratispinosus* (LANG 1956, fig. A 14).

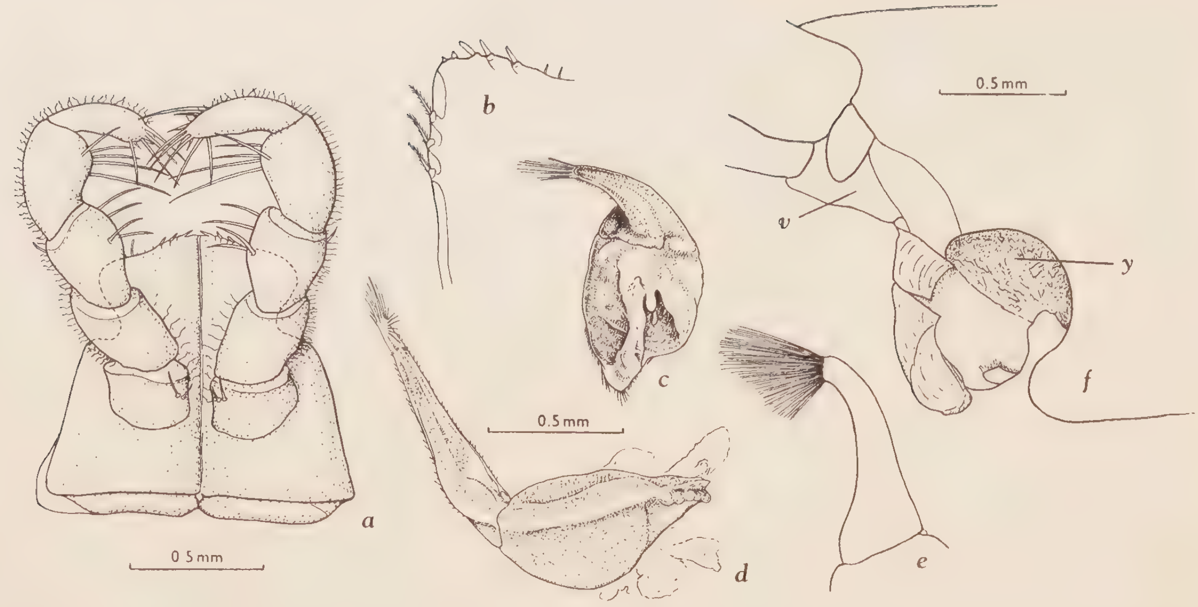

Fig. 42. *Herpotanais kirkegaardi* n. sp., ♀; a, maxillipeds; b, inner corner of endite seen obliquely from the inner side; c-d, epignath in frontal view and from the edge; e, distal end of epignath in frontal view; f, labrum from the side (v, first joint of antenna; y, cavity for (removed) left mandible).

Cheliped (fig. 43 a) very similar to that of *N. s. hadalis,* although more slender. The swollen basis is also still larger, being more than two thirds of the length of carpus; the latter joint has subparallel margins and is about one fifth shorter than propus. This is only a little more than twice as long as broad. Upper margin of propus with a low, sharp keel stretching from the insertion of the movable finger almost to the proximal end of the joint. At the insertion of the finger there is a seta on the interior side. The fixed finger has the inner half of the cutting edge (43 b) absolutely straight without denticles (as found in *N. s. serratispinosus* and *s. hadalis),* and the outer half consisting of five irregular, blunt teeth of which the two distal ones are only half as large as the remaining ones and slope downwards to base of the stout, brown-coloured terminal part; four short setae issue from the side of the finger and two near the outer base of the terminal part. The movable finger with a wavy inner margin and a long claw; a seta is found on the inner side, not far from the insertion.

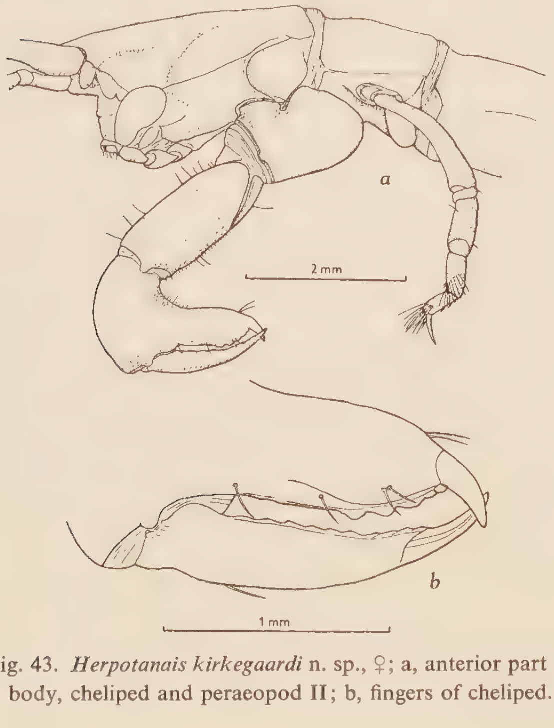

Fig. 43. *Herpotanais kirkegaardi* n. sp., ♀; a, anterior part of body, cheliped and peraeopod II; b, fingers of cheliped.

Peraeopods with two types of spines: serrated (fig. 44 a) and simple which may or may not be furnished with scattered hairs. The spines are placed in rows on carpus and propus, and their number in each row varies to some extent from one specimen to another. In the following description their exact number has been given only in the female type.

Peraeopod II (figs. 43 a and 44 a) with rather strongly curved basis. Carpus has on the interior side four short spines and three subterminal spines one of which is only half as long as the others (one only visible in 44 a); besides, the joint is furnished with a row of seven long, slender spines with scattered, fine hairs. Propus with three spines on the inner margin and with three subterminal spines of increasing length; the distal half of these six spines as well as of the three subterminal spines on carpus are very finely serrated along both margins (44 a). Terminally there is on propus a short comb-shaped

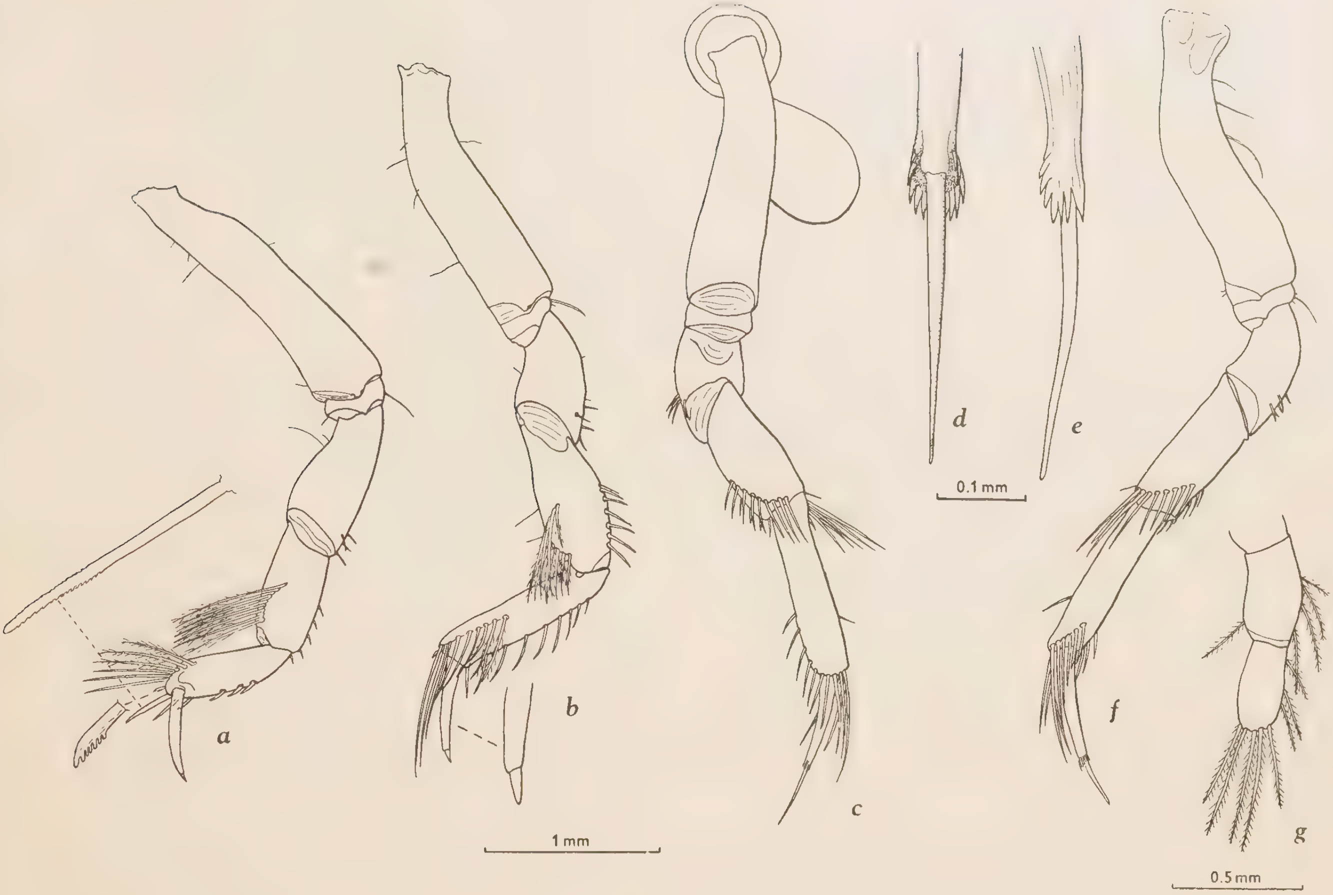

Fig. 44. *Herpotanais kirkegaardi* n. sp., ♀; a-f, left peraeopods; a, II obliquely from behind; b, III from the side; c, V obliquely from in front (with rudimentary ooștegite); d-e, distal end of dactylus and claw of V; f, VI from the side; g, left pleopod 1.

spine almost equal to that found for instance in *N. s. serratispinosus* (Norman & Stebbing 1886, pl. 23, I gn. 2). Finally, propus bears an outer row of six long, slender spines, three of which have scattered, fine hairs. Dactylus in this and the two following peraeopods simple and the claws as short as in *N. s. hadalis*.

Peraeopod III (fig. 44b) with the same proportionate lengths of joints as in *N. s. hadalis*. On carpus there is a row of seven-eight spines on the inner margin and a curved, subterminal row of nine long, feathered spines. Propus with eight inner spines and with the same three stouter spines and a short comb-shaped spine terminally as in II. There are nine long, slender spines in the outer row.

Peraeopod IV equal to III, but with eight short, inner spines on carpus. Propus with altogether ten inner, serrated spines, one short, comb-shaped and at least ten long and slender outer spines; all the spines on propus form a continuous u-shaped row, bending round the apex outside the insertion of dactylus.

Peraeopods V-VII (fig. 44c and f) have the same general shape. On the short and stout merus there are four short exterior and two short interior spines. On carpus there are an oblique exterior and interior row of serrated spines and three-five somewhat longer spines (with scattered hairs) at the distal end of the latter row. On propus a continuous row of spines runs round the apex; there are five long, slender spines terminally, and at both ends of this row a varying number of serrated spines along the margins. No short, comb-shaped spine is found terminally. Dactylus (44d-e) with only about twelve inconspicuous spinulets at the base of the claw which is nearly as long as dactylus. Dactylus + claw almost as long as propus.

Pleopods (44g) reduced, with two short, thick joints only which are furnished with a number of setae (with scattered, fine hairs) as shown in the figure.

Uropod (fig. 37a) with a long, cylindrical, somewhat curved peduncle and a minute, two-jointed exopodite. The endopodite is one third longer than the peduncle and consists of five subequal joints in the type specimen.

Description of male (Z):

In the following description only the *differences* between the sexes will be mentioned.

Body (fig. 35 b and 36 b) seems even more slender than in the female (probably owing to the more elongate carapax), but is actually also 10.7 times longer than broad.

Carapax, as mentioned, more elongate being 1.6 times longer than broad. Besides, there is a distinct transverse furrow connecting the two oblique furrows also found in the female, and a straight, inconspicuous furrow across the base of the rostrum.

Peraeonites (fig. 35b and 36b) with much more convex lateral margins. They all have a transverse excavation in front, and from the posterior base of the projections for the insertion of the peraeopods a distinct, although short furrow continues onto the dorsal part of the segment. The relative length of the peraeonites is almost the same as in the female.

On the posterior third of the ventral side of peraeonite 7 (fig. 45a) the paired genital openings are found, each of which is situated on the interior side of a low and short keel.

Pleonites equal in dorsal view, but while in the female they are almost cylindrical, seen from the side, they are in the male (fig. 45a) more excavated posteriorly on the ventral and lateral sides.

Pleotelson of the same shape as in female, but the posterior projection and the anal doors are substituted by two closely set, ball-shaped convexities which are totally calcified. Moreover, there are no circular impressions on the ventral side, but instead a v-shaped, backwards pointing impression, running from near the antero-lateral corners almost to the mutual base of the two ball-shaped convexities. No ventral setae are found.

Antennula (fig. 45 b) considerably more slender, the first joint being for instance almost six times as long as broad and only faintly swollen at the base; there are also fewer setae. The first joint of the flagellum has a large distal projection on the outer side, furnished with a dense tuft of aesthetes which are somewhat longer than the joint. Then follow four much narrower joints of which each of the three proximal bears a long, stout olfactory hair terminally. The very minute last joint has three rather long setae distally.

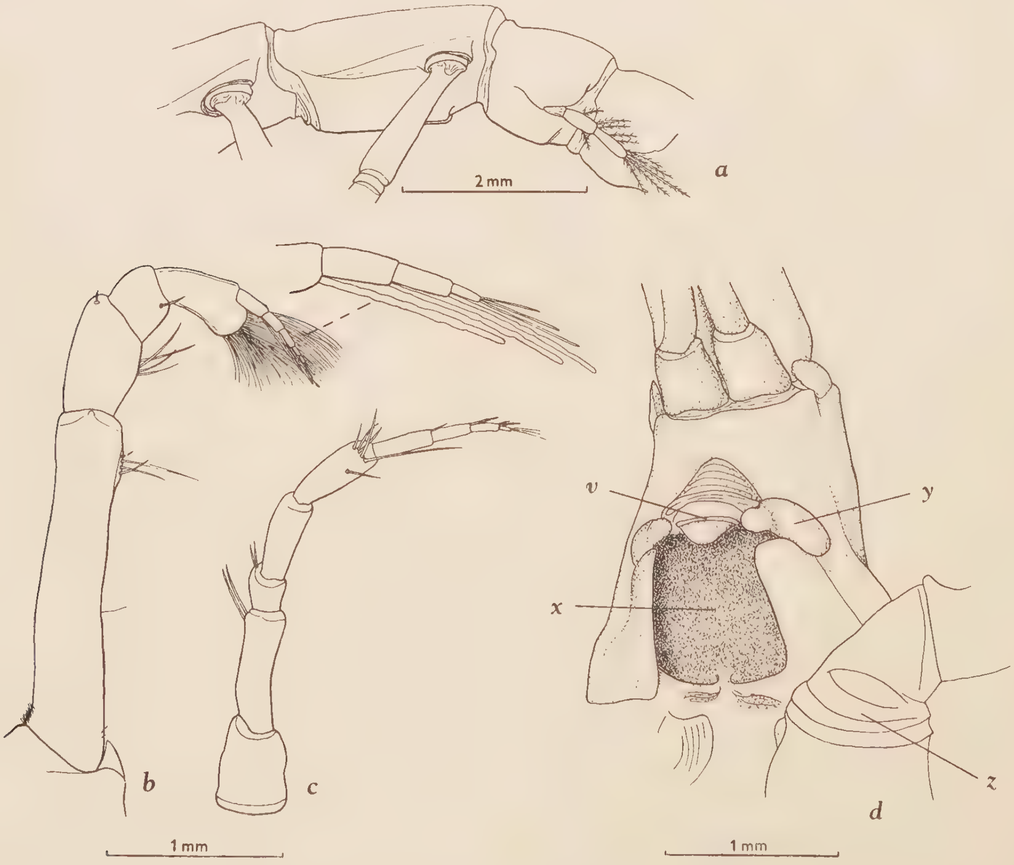

Fig. 45. *Herpotanais kirkegaardi* n. sp., ♂ Z; a, lateral view of peraeonite 7 and pleonite 1; b, antennula from above; c, antenna from below; e, mouth area a little obliquely from below, with maxillipeds and maxillae removed (v, projecting edge of labrum (cf. fig. 42f); x, mouth cavity; y, reduced mandible; z, proximal part of left cheliped).

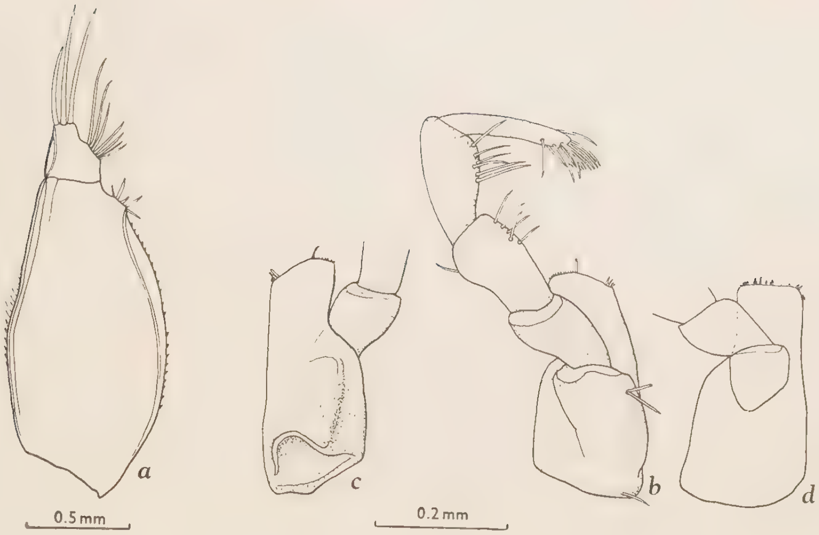

Fig. 46. *Herpotanais kirkegaardi* n. sp., ♂; a-c, male Z; a, right maxilla; b-c, right maxilliped (c, interior side); d, basal part of right maxilliped of male Y.

Antenna (fig. 45c) also more slender than in the female, but not so slender as in the males of *Neotanais*. Second joint more than three times longer than broad, and this and the succeeding joint each with two setae instead of one. Joint 5 with three more setae than in the female. Flagellum with four joints.

Mouth-parts consist of the rudimentary body of the strongly projecting, totally calcified labrum (fig. 45 d, v), the reduced mandibles (45 d, y), the highly modified maxillae, and the maxillipeds.

Maxilla (fig. 46a) much more expanded towards the basal part than in the female, the inner margin being strongly convex and with small denticles. There is only one distinct, distal lobe which is furnished with two groups of simple setae (three and six) and a low inner projection with four to five very short, spine-like setae.

Maxillipeds (fig. 46b) are so fused with the buccal frame that they are difficult to remove. There seems to be only one joint in the basal part (the first, short joint probably immovably fused with the buccal frame). There is a seta near the inner, lower corner. As in the female this joint is totally fused with the endite and has on the inner side (46c) a longitudinal, vaulted area, which is abruptly cut off at the base. The distal end of the endite differs from the female in having its greatest extension laterally; also the arrangement with spines and setae distally is somewhat different. The palp is comparatively larger, and the fifth joint is longer and narrower. There are also more spines on joints 4 and 5. Epignath as in female.

Cheliped (fig. 47 a) somewhat more slender than in the female, especially basis and carpus; the latter is almost twice as long as basis and more than three times longer than broad; on the proximal, lower corner of carpus there is a rounded projection.

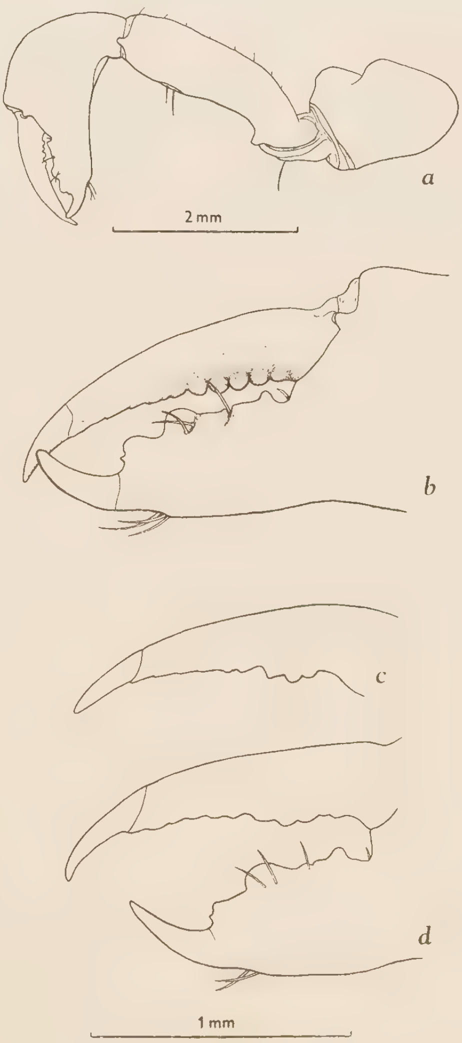

Fig. 47. *Herpotanais kirkegaardi* n. sp., ♂; a-b, male Z; a, left cheliped; b, fingers of left cheliped; c, movable finger of male X; d, fingers of male Y.

Propus also somewhat more slender, being $2^1/_2$ times longer than broad. The cutting edge of the fixed finger (47b) has a rounded tooth proximally, followed by a straight edge, which in the middle is broken off by a tiny fissure with one seta. Then follows two more very prominent teeth and yet a small tooth on the distal part of the cutting edge which is bent at right angles to the preceding part of the edge. The terminal, brown-coloured part is bent somewhat upwards. On the outer side of the fixed finger there are two more, closely set setae, on the inner side near the gap between the fingers there is one seta, and on the underside there are three setae instead of two in the female. The movable finger with five rounded teeth on the proximal part of the cutting edge and with a slightly irregular, distal part. The movable finger is not nearly so curved as in the males of *N. giganteus* and *s. serratispinosus*.

Peraeopod II as in the female, but there are only five long spines on carpus and they have no scattered hairs. The same applies to the long spines on propus as well as to the long spines on all the succeeding peraeopods in the male. Moreover, the three stout spines on the lower margin of propus (of II) are substituted by four slender spines, and the short, distal spine is not comb-shaped.

Peraeopod III only differs (apart from the above named differences) in having seven long spines on carpus and in having the short spine on propus more slender.

Peraeopod IV also equally shaped, except that the spines on the anterior side of propus are considerably shorter.

Peraeopods V-VII differ from those in the female in the following respects: carpus has about eight equally long spines and the claw is less than half as long as dactylus which has a simple apex distally, without spinulets.

Uropods in Z (and the other males) with more elongate joints (fig. 52) and with more setae on these. Most of the males also appear to have a maximum number of joints (table 4).

Size:

The largest female (the type specimen) is 25.0 mm long and 2.4 mm broad; the longest male (Z) is 22.8 mm long and 2.2 mm broad.

Development:

Apart from the adult specimens the material comprises eleven specimens which I regard as preadult. Since the development in this family was hitherto unknown I have described these specimens in detail below. Table 4 gives their total length as well as that of the adult specimens.

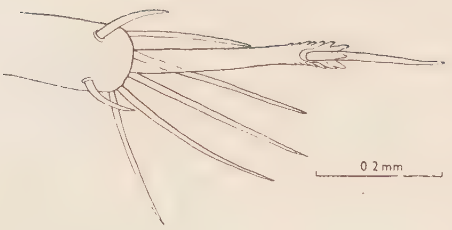

Fig. 48. *Herpotanais kirkegaardi* n. sp., specimen A; distal end of peraeopod VI a little obliquely from below.

The various size groups differ from the adult females in the following respects (differences in uropods are mentioned on p. 229):

Specimens A and B. Body considerably less slender being only 7.5 times as long as broad (as against 10.7 in adults). Carapax proportionately longer and much broader than the peraeonites, which are shaped as in adult, except the seventh which is shorter. Pleonites quite cylindrical and almost four times broader than long. Antennula with only three joints in flagellum and with one long and one short lateral setae on first joint of peduncle and one long seta on second. Antenna with four joints in flagellum. Cheliped as in adult female, but shorter and thicker. Considerably fewer and shorter setae on peraeopods, and the collar of spinulets on dactylus of V and VI continuing for a very short distance only towards the base (fig. 48). Peraeopod VII and pleopods totally missing, the position of the insertion being only indicated by a low convexity.

Specimens C and D. Body 8.5 times as long as broad. Antennula with three joints in flagellum and two lateral setae on each of the two first joints of the peduncle. More setae on peraeopods than in A

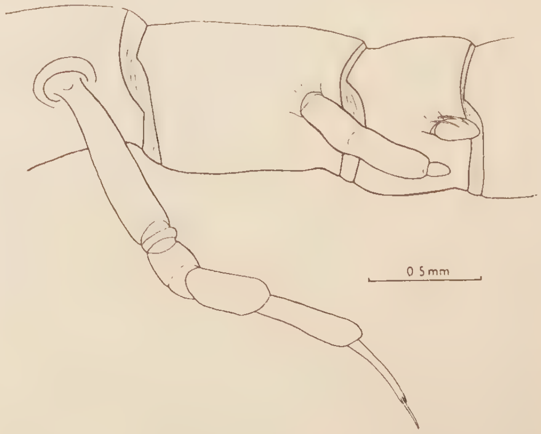

Fig. 49. *Herpotanais kirkegaardi* n. sp., specimen C; peraeopods VI (setae omitted) and VII, and pleopod 1.

Table 4. Size and particulars of oostegites and uropods in the material of *Herpotanais kirkegaardi* n. gen., n. sp.

Specimens	Total length mm	Rudimentary oostegites	No. of joints in endopodites of uropods	
			left	right
pread. A	8.1	÷	4	4
– B	8.2	÷	4	4
– C	11.2	÷	4	4
– D	11.4	÷	4	4
– E	12.7	÷	4	4 (5)
– F	13.2	÷	4	4
– G	14.3	÷	5	5
– H	14.3	÷	4	5
– I	15.4	÷	6	5
– J	15.7	÷	5	5
– K	16.6	÷	4	4
♀ ad. L	17.6	÷	4	4
– – M	19.6	÷	5	5
– – N	20.4	÷	4	4
– – LL	20.9	+	5	5
– – MM	21.4	+	6	6
– – NN	21.8	+	4	4
– – O	22.0	÷	4	4
– – P	22.5	÷	6	5
– – Q	22.5	÷	5	4
– – R	22.7	÷	5	5
– – OO	22.9	+	6	6
– – S	23.4	÷	5	5
– – PP	23.8	+	5	4
– – QQ	24.0	+	6	5
– – RR	24.2	+	5	5
– – SS	24.3	+	4	4
– – TT	24.5	+	5	5
– – UU	24.6	+	5	5
– – type	25.0	+	5	5
♂ – V	18.3	÷	6	5
– – W	c. 18.7	÷	6	6
– – X	20.3	÷	6	6
– – XX	c. 20.4	÷	6	5
– – Y	21.2	÷	6	6
– – Z	22.8	÷	5	5

and B. Peraeopod VII (fig. 49) has one long joint with an indistinct subdivision and one short, terminal joint. Pleopods bud-shaped (49).

Specimens E and F. Body almost as slender as in adult. Antennula with three horizontal setae on joints 1 and 2 of peduncle and with four joints in flagellum. Peraeopod VII with all joints developed, but less than $^2/_3$ as long as VI; dactylus and especially claw very short, their combined length being less than that of propus. Pleopod with two joints, but the second is only half the length of the first and has only two short, terminal setae.

Specimens G and H. Although they are exactly equally long G and H show remarkable differences: In G flagellum of antennula has five joints, and the length of dactylus + claw of peraeopod VII is almost like that of VI, but the pleopods have only three simple setae each. In H the flagellum has only four joints and dactylus + claw of VII are conserably shorter than that of VI, but the pleopods have almost all the final setae present, and they are feathered.

Specimens I-J-K differ from the adults only in the following respects: Four joints in flagellum of antennula, terminal setae on propus of peraeopod VII shorter than dactylus in J and K (but as long as dactylus in specimen I – and adults), and pleopods a little shorter and in K with few setae only.

In L and M the flagellum of the antennula have five joints, and the setae on all peraeopods are fully developed, as are also the pleopods.

Variation in adult females:

The only differences between females with and without oostegites which I have been able to find are that the latter females are a little more slender and have a little less rectangular peraeonites than the females with oostegites. In this respect the former stand between the shape of the latter and that of the males (see fig. 36).

A thorough investigation of all the adult females present revealed only very slight differences. A few specimens have a very faint transverse furrow across carapax but by far not so marked as in the males. The same specimens have also, besides the two circular depressions on the ventral side of pleotelson, a v-chaped depression like that found in the males (p. 224). The armament with lateral setae on the first two joints of antennula varies considerably: on the first joint from six in the type to five (rarely), four (usually) and three (rarely); on the second joint there are sometimes only three, equally long setae. All other females than the type have four joints only in both flagella of the antenna, and al-

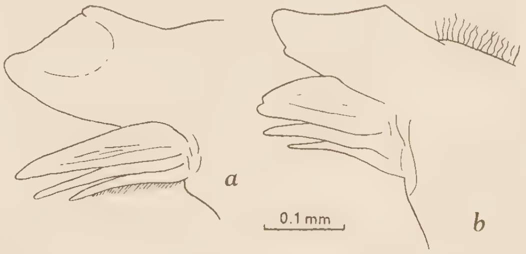

Fig. 50. *Herpotanais kirkegaardi* n. sp.; distal end of right mandible; a, specimen QQ; b, specimen RR.

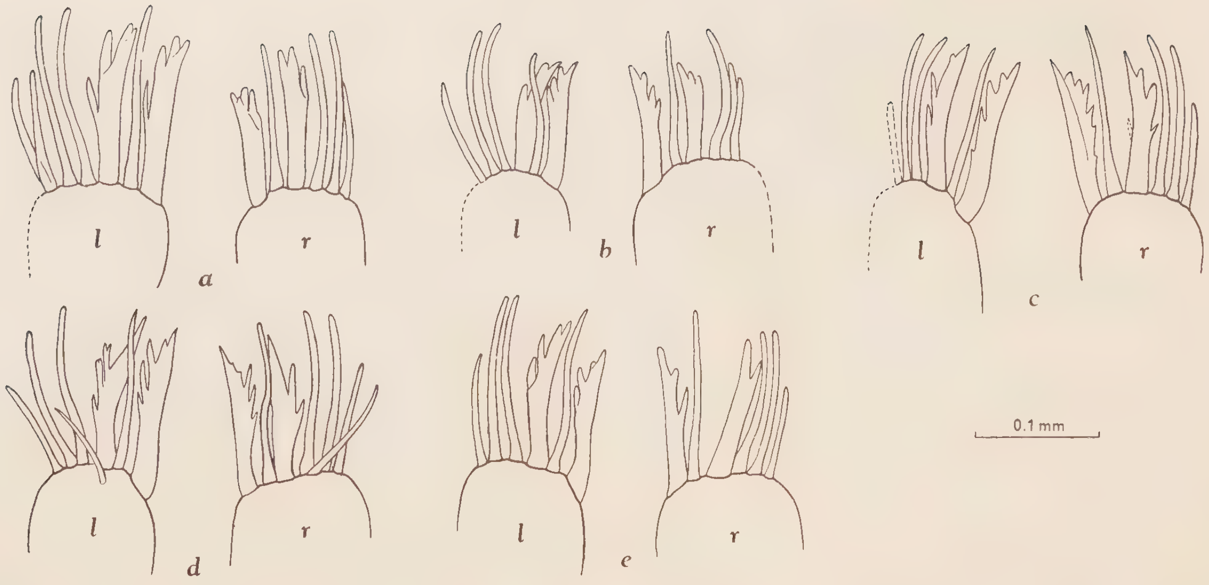

Fig. 51. *Herpotanais kirkegaardi* n. sp.; variation in armament of fixed endite of left (l) and right (r) maxillae; a, type specimen; b-e, specimens N – RR – QQ – PP.

most all of them have two setae on the second joint of the antenna.

I have dissected the mouth-parts of four females besides the type (N, PP, QQ, and RR) in order to elucidate the variation in especially mandibles and maxillae of the family. A comparison with the type (figs. 39-42) shows the following differences: (1) *Left mandible:* Specimen N has the projecting part of pars incisiva still more pronounced, in QQ there are a few very minute hairs near the distal end of the two spines, and the furthest projecting tooth on the movable lacinia is bilobed. (2) *Right mandible:* Pars incisiva of QQ is broader (fig. 50a) and of RR somewhat differently shaped distally (50b) and with a very small but distinct nodule on the outer margin, corresponding to the one found e.g. in *s. serratispinosus* (LANG 1956, fig. A5); the inner spine of QQ (fig. 50a) and of PP is narrower and of RR broader (50b), and the outer spine of QQ has fine hairs along the outer margin. (3) *External endites of maxillula* all with ten spines, but in RR both endites have long and closely set hairs along the outer, distal margin; both *internal endites* of N have the inner, distal seta twice as long as the two other short setae. (4) *Maxilla:* The length of the setae on the endites is somewhat varying; the inner lobe of the movable endite of N and PP (left side) has six and both the corresponding lobes of QQ have 7 setae each, instead of the usual five; there is also a slight variation in number of setae on the fixed endite and in shape of the furcated spines (fig. 51), but their number and position are constant; in QQ the setae of the inner row are minutely bifid and in PP most of them are finely feathered; their number is always

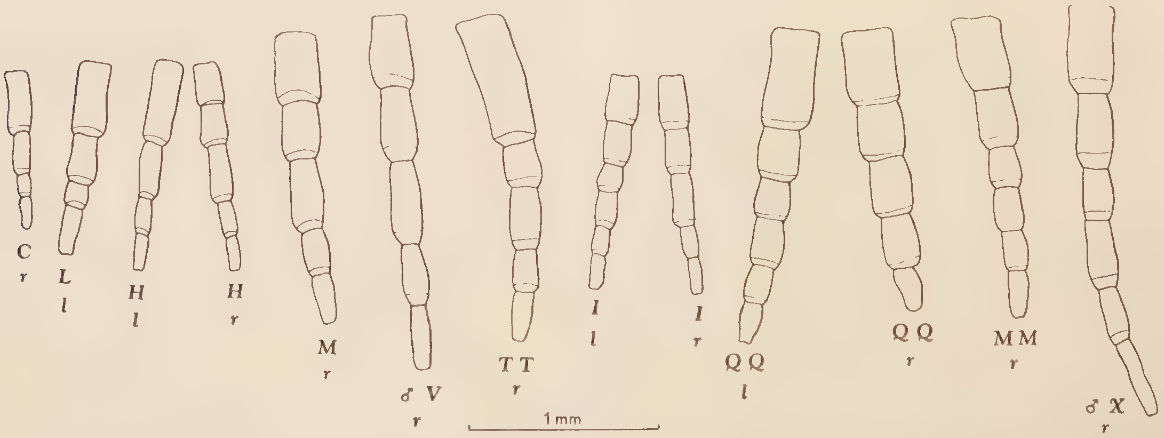

Fig. 52. *Herpotanais kirkegaardi* n. sp.; variation in uropods; capital letters indicate specimens; l = left, r = right.

eleven. (5) *Maxilliped* with some variation in number of setae on the palps and in the size of the short spines on the inner, distal corner of the endite.

Finally, a great variation in the number and mutual length of the joints of the uropods is found, as shown in table 4. The table indicates that this variation must be quite incidental, the number of joints in this species not being influenced by the age of the specimens. In fig. 52 is shown the range of variation in the uropods of the material.

Variation in adult males:

In the material only six adult males are found, one of which (Z) was compared to the female type above. Of the other five males (V, W, X, XX, and Y), whose lengths are given in table 4, W and XX had no carapax preserved. V, X, and Y differ from Z in the following respects: In X and Y the outer end of maxillae were visible between endites of maxillipeds and labrum. In all three males the lower projection of the maxilla has six, somewhat longer setae, and the endite of the maxilliped is straightly cut off, with right-angled corners; in Y there are some very short setae on the margin (fig. 46d), and in X and Y two inner spines only are found; joint 3 of the palp in X and Y with only four inner setae. The different shape of the cheliped cutting edges in X and Y is shown in fig. 47; in V the shape is almost as in Z. All three specimens have only two setae on the lower side of the fixed finger. Variation in uropods is shown in table 4. Apart from these differences the four males are perfectly equal.

Remarks:

The generic characters (see p. 218) clearly separate *H. kirkegaardi* from all species of *Neotanais*. Moreover, only *N. affinis* (Wolff 1956b) has the pleotelson equally elongate. The species is named after Jørgen Kirkegaard, M. Sc., Zoologist on the Galathea.

Distribution:

The Kermadec Trench, N. E. of New Zealand, 7150 m, 1.3°C.

D. GENERAL REMARKS

1. Supposed hermaphroditism in certain species of Apseudes and Neotanais

When studying the great variety found in the males of especially *Apseudes gracillimus* and *Neotanais serr. hadalis* it at first appeared to me that this might be another instance of the "high and low dimorphism" in adult males of i. a. Tanaidacea, described by G. W. Smith (1906). In a rich material of males of *Leptochelia dubia* (Krøyer) he found a variation in size between 2 and 4 mm. The large males have constantly immensely developed chelae (pl. 20, fig. 7) with a great distance between the tubercles on the movable finger but with a small comb of spines; besides, the antennulae are long (10-11 joints) and with rather few and short aesthetes. The short males have more or less reduced chelae with closely set tubercles and a comparatively larger comb; the antennulae are a little shorter (9-10 joints), but mainly with more plentiful and somewhat longer aesthetes. Smith's table 2 (p. 339) shows that there is an even transition between large and small males and their size of the chelae. All the males have the mouthparts degenerate. The ovigerous females are about 3 mm long and with quite differently shaped chelae and antennulae: the former are much smaller than in any male and without tubercles; the latter are short, 3-jointed and without aesthetes.

Previous to Smith's paper Fritz Müller and A. Dohrn had described apparently similar instances. However, in the case of Dohrn who mentioned and figured (1870, p. 132, pl. 12, figs. 7 and 17) an instance of pronounced dimorphism in *Tanais Savignyi* (= *Leptochelia dubius* Krøyer) it was later shown by Sars (1886, p. 334) that the chelae belonged to males of two different species, viz. *L. dubius* and *Heterotanais anomala* Sars (1880). As far as Müller is concerned he described and illustrated (1864, p. 12, figs. 3-6) a remarkable dimorphism in size and shape of the chelae of a Brazilian species which he called *Tanais dubius* (?) Krøyer. This difference is so great that it seems almost certain that it must be males of two different species, all the more since Müller stated that although he had studied "many thousand" of the males he had found no intermediate forms between the two types. On the other hand, the difference between the antennulae of the two forms is almost identical with that found in the two forms of males of *L. dubius*, described by Smith (1. c.), namely greater length of joints but fewer and shorter aesthetes in males with large chelae, and the opposite in males with small chelae. In spite of this fact I take it, however, for almost granted that a closer investigation of especially the females will disclose that MÜLLER mixed up two species.

When comparing SMITH's case of high and low dimorphism in *Leptochelia dubius*[1] with the differences found in the males of *A. gracillimus* and *N. serratispinosus hadalis* it is evident that the latter instances have nothing to do with the former. First and foremost all the males (from the same environment) are equally large (see table 3, p. 205 and p. 215). Secondly, the differing characters in the males of each of the two species represent intermediate features between male and female characters, while in *L. dubius* the chelae and antennulae of the two forms of males resemble each other much more than any of them resemble the same appendages of the female.

The fact that some of the males especially in *Apseudes gracillimus* and *Neotanais serr. hadalis* definitely exhibit secondary sexual characters of the respective females has induced me to suppose that at any rate some of the adults of these two (and probably several more) species of the two genera concerned are hermaphroditic. In *A. gracillimus* (and *A. galatheae)* it is highly probable that the male phase is the primary, the species thus being protandric hermaphrodites. *N. serr. hadalis* is more dubious; as shown below I regard it as most likely that the subspecies normally has separate sexes, but that occasionally simultaneous hermaphrodism may occur.

In 1953 LANG described the first known instance of a hermaphroditic tanaid, *Apseudes hermaphroditicus*. Apparently, all the specimens of this species have the conical projection on the sternite of the last peraeonite fully developed, and the sexual products seem to mature simultaneously. LANG (1. c., p. 350) suggests that also in gonochoristic (uni-sexual) species both kinds of sexual glands are to be found. The present instances of supposed hermaphroditism seem to speak in favour of this suggestion, and it is much to be regretted that the preservation of the material does not allow an investigation of the sexual glands.

In the present, necessarily limited, material of tanaids the following indications of hermaphroditism can be found.

a. Apseudes gracillimus and A. galatheae

1. The fact that no preadult stages or adult female stages in any of the two species are of the same size order as that covered by the males present from the same station *(gracillimus:* from Ingolf Station 22 & Thor St. 166 and *galatheae:* from Galathea St. 658). The gap in size between the latest preadult stages and the smallest of the adult females is considerable in both species, but is filled in by the males in a very convincing way (see table 1, p. 198 and table 3, p. 205).[1]

2. The presence of two distinct intermediate forms in *gracillimus,* namely males F and H which have adopted several female characters (see the list of male and female characters p. 206). The best preserved male character in F and H is the projection on peraeonite 7; this agrees with the fact that in the protandric hermaphrodite *Pandalus borealis* the appendix masculina is reduced very slowly when the transition to female takes place (JÄGERSTEN 1936, p. 15).

3. Specimen B in *galatheae* (p. 197) which is in the last manca or the first youth stage, has – together with many features found in the adult females – two distinct male characters: A conspicuous projection on peraeonite 7 and rudiments of pleopods.

b. Neotanais

Evidences of hermaphroditism are found in *N. serratispinosus hadalis* and probably in *N. longimanus*.[2]

As pointed out on p. 216 male B of *N. serr. hadalis* shows a remarkable transition between females and male A. The following characters in male B are purely or almost purely female: Shape of peraeonites; uncalcified terminal face; shape of right mandible (except molar process) and of maxilliped. – The following characters are about half way between female and male (intermediate): Shape of pleonites and peduncle of antennulae; partial reduction of left mandible and of molar process of right; shape of maxillae and armament with spines on peraeopods. – Finally, these characters are purely or almost purely male: Presence of two genital openings on peraeonite 7; shape of carapax; ventral furrow proximally on pleotelson; shape of flagellum of antennulae; absence of maxillulae; shape of chelipeds.

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[1] The correctness of SMITH's interpretation lies beyond the scope of this paper and is therefore not considered here.

[1] As often found in Tanaidacea there is, however, a considerable difference in size of the adults from one locality to another, certainly influenced by the environment. In *galatheae* the three adult females from St. 664 in the Kermadec Trench (from a depth which is more than 2000 m less than in St. 658) are thus a little smaller than the adult males from the deep station (unfortunately, no males were collected at St. 664), and in *gracillimus* one of the two adult males from the Indian Ocean (Galathea St. 193) is somewhat smaller than the males collected by the Ingolf and the Thor in the North Atlantic and the other male is even larger than the largest North Atlantic female. Moreover, the great difference in size in the two males from the same station in the Indian Ocean does not speak in favour of these males of *gracillimus* being protandric hermaphrodites in the said locality. Much more material is needed to solve this problem.

[2] STEBBING (1893, p. 324) drew attention to the fact that BEDDARD in his definition of the new genus *Neotanais* (1886 b, p. 124), based on the two only males of *N. americanus* n. sp., mentioned the presence of well developed

Especially the fact that all males of *Apseudes gracillimus* and *galatheae* are smaller than the females from the same locality made me suggest above protandric hermaphroditism in those species. In the unfortunately small material of *Neotanais serr. hadalis,* however, the lengths are as follows:

Pure female (type): 15.0 mm
Pure female : 15.1 mm
Transitional male (B): 15.5 mm
Pure male (A): 15.7 mm

Moreover, the males of *Neotanais* have always the mouth-parts reduced so that they only serve respiratory purposes, have no anal opening and probably the alimentary canal reduced or absent, i.e. they exclusively live "*pour l'amour et la mort*". It is impossible to imagine that such males should be able not only to survive this period of compelled fast, but should also be able afterwards to regenerate the organs for food intake and digestion, if protandric hermaphroditism prevailed in this case as well.

The opposite, protogyne hermaphroditism, is of course possible, but very unlikely. It is extremely rarely found within the Animal Kingdom (in most Alcyonaria, the Kamptozoan *Loxosoma, Agriolimax laevis,* the Holothurian *Leptosynapta inhaerens,* and in certain salps) and is sometimes connected with unusually large and therefore energy demanding male sexual organs. Nothing similar is found in this case.

I find that the most plausible explanation is that *serr. hadalis* is normally gonochoristic, but that simultaneous hermaphroditism (such as in *Apseudes hermaphroditicus)* may occur. Unfortunately, the scarcity of material prevented me from studying the sexual glands of especially the transitional male B which would certainly have solved the problem.

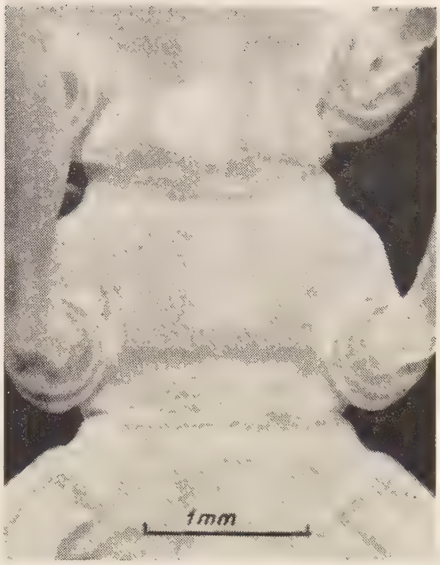

Fig. 53. *Neotanais longimanus* Wolff; ventral side of peraeonite 7 in female type; the scar-like marks are found on the two low protuberances not far from the posterior end of the segment.

In *N. longimanus* (Wolff 1956b, p. 49) I found ventrally on peraeonite 7 of the female type specimen and another female two scar-like marks on very low protuberances (fig. 53) in exactly the same place where the genital openings are found in males of other species of *Neotanais* (unfortunately, the small material of *longimanus* included no males). In a third female with fully developed oostegites (but lacking most of pleon) these marks were searched in vain. Apart from the presence or absence of marks and of oostegites I could find no other differences between the three females in question. These marks may perhaps be interpreted as the last indication of a previous simaltaneous hermaphroditic stage which is now substituted by a purely female stage. There may also be a possibility that the marks are the last trace of a previous purely male period and thus indicate protandric hermaphroditism in this species (cf. what was said above about the retarded reduction of primary male sexual characters in *A. gracillimus* and *Pandalus borealis)*. In these cases it is, however, difficult to explain why the female without marks and with fully developed oostegites is only about 17.3 mm long, while the two mark-bearing females are 18.2 and 19.2 mm long, respectively, which certainly indicates that they are older.

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mandibles. In my opinion this is due to the fact that at any rate one of the two specimens is a female, considering Beddard's figure of the antennulae (pl. 16, fig. 5) and his description (p. 125) in which he wrote nothing about any tuft of aesthetes which is otherwise a very conspicuous feature in males of *Neotanais*.

In *Herpotanais kirkegaardi* a few females have a very faint transverse furrow across the carapax and a ventral, v-shaped depression on pleotelson. These are otherwise male characters in that species, but since the furrow and the depression are much less marked than in the males and these females exhibit no other male characters I do not regard it as an indication of hermaphroditism, all the less since the rather large material of *kirkegaardi* shows no other differences comparable to those found in *A. gracillimus* and *N. serr. hadalis*.

It is noteworthy that some of the main secondary sexual characters, such as shape of carapax and of flagellum of antennulae (together with the primary sexual character: male genital openings) are found in all three intermediate males: F and H of *A. gracillimus* and B of *N. serr. hadalis*. Also two female characters are common to all three males, namely shape of peraeonites and none or only a rather slight reduction of the mandibles.

So far hermaphroditism has been stated – with more or less certainty – in the following species (and subspecies): *Apseudes hermaphroditicus, A. gracillimus, A. galatheae,* and *Neotanais serr. hadalis.* Common to these four species is that they occur in cold water (from 4.9 – 1.1°C.) and common to the last three ones their occurrence at great depths (1000 – 8200 m). It seems likely that at any rate constantly low temperatures may influence the development of hermaphroditism in tanaids, since it was never previously recorded by carcinologists working with tanaids from shallow water at temperate, subtropical or tropical latitudes. Some of these keen specialists (such as G. O. Sars, Claus, Norman and Hansen) have studied tens or hundreds of both males and females of the same species without recording – as far as I know – any instances of transition between males and females in one and the same species.

2. Vertical and regional distribution

a. Apseudes

In Nierstrasz' work on the Tanaidacea of the Siboga-Expedition (1913) he enumerated all the species of *Apseudes* known at that time. Since then new species or records have been added by the following authors: Barnard (1914, 1920, 1935 & 1940), Beddard (1886 b), Chilton (1924 & 1926), Hale (1929), Lang (1953 a), Menzies (1953), Miller (1940), Monod (1925 & 1935), Shiino (1937 & 1952), Stephensen (1915), and Vanhöffen (1914), while Lang (1949 & 1955) transferred several species to other genera or demonstrated cases of synonymy. As a result, about 50 species are known today, but it is an open question whether they should all be included in *Apseudes*. For this reason I have confined myself to make only a rather superficial survey of the bathymetric range of the genus:

Fresh- or brackish water:		4 species
Marine,	littoral:	12 –
–	c. 10 - c. 200 m:	17 –
–	c. 25 - c. 1400 m:	2 –
–	c. 100-1400 m:	7 –
–	c. 1400 - c. 3000 m:	7 –
–	1000-3700 m:	1 –
–	1600-4400 m:	1 –
–	4400 m:	1 –
–	4500-6800 m:	1 –

Thus only the following six species (12 %) are true abyssal inhabitants occurring only at depths greater than 2000 m and at temperatures below 4°C.: *A. simplicirostris* Norman & Stebbing, *A. tenuis* Hansen, *A. sp.* from the Antarctic deep-sea (Vanhöffen 1914, p. 461), *A. gracilis* Norman & Stebbing, *A. weberi* Nierstr. and *A. sibogae* Nierstr.; only one species, *A. galatheae,* is so far known to penetrate into the socalled hadal zone (Bruun 1956).

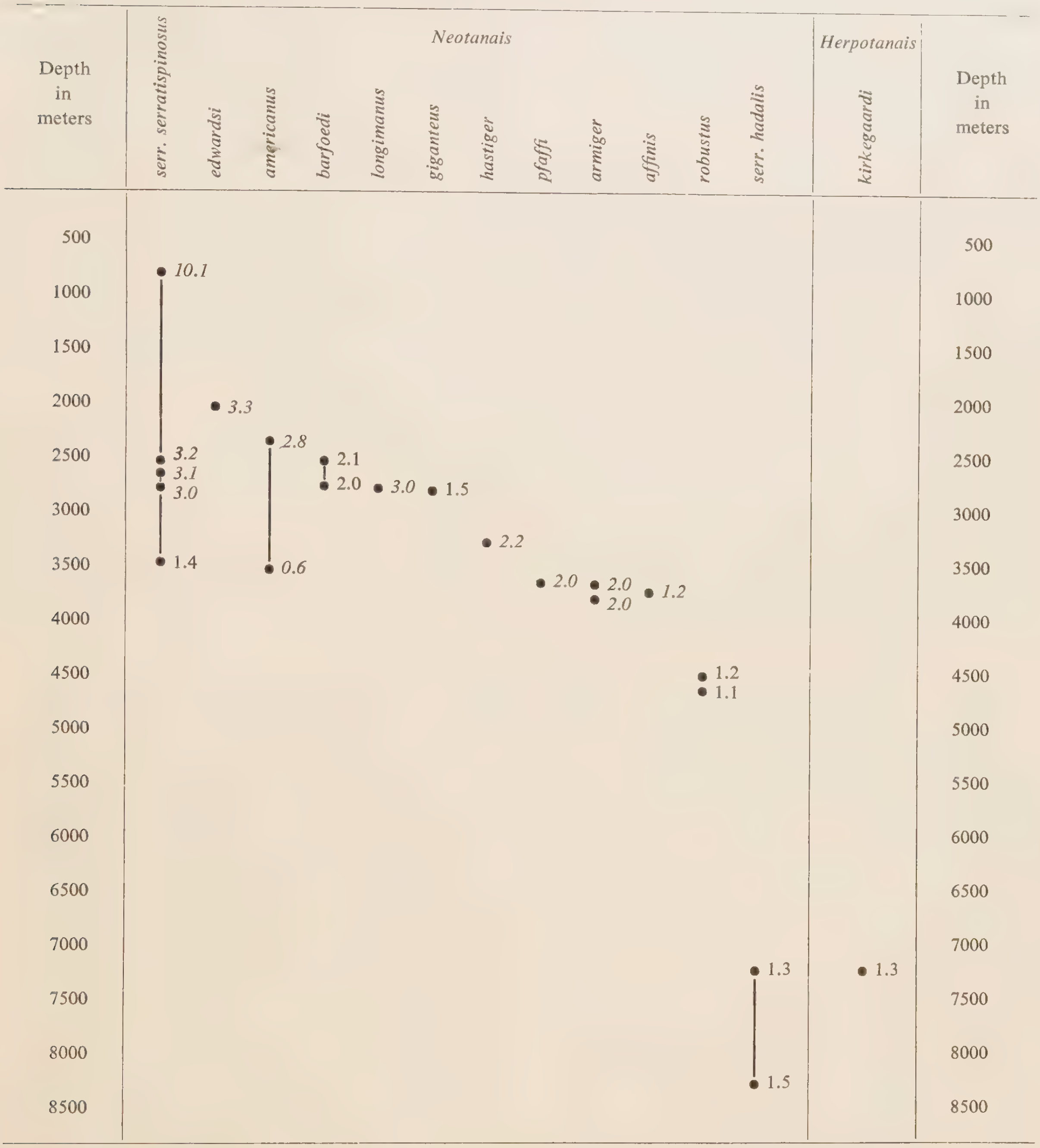
The horizontal distribution of *Apseudes* is, as already pointed out by Nierstrasz (1913), cosmopolitan. The fact that more than half the species occur in the Atlantic Ocean and the Mediterranean is rather an indication of which areas are the best known than a true information about the distribution.

b. Neotanaidae

The vertical distribution of this very well defined family is given in table 5. It will be seen that apart from the record of one male of *N. serr. serratispinosus* (= *laevispinosus)* it is an exceedingly pronounced deep-sea and cold water family, no doubt *one of the most abysso-hadal families or larger taxons of marine invertebrates to be found: except for the above mentioned specimen it has been recorded only from depths exceeding 2000 m and at temperatures below 3.3°C.* The average of the total of 22 depth records is 3600 m.

The single adult male of *serr. serratispinosus* was collected by the Porcupine Expedition 1869, St. 1, in the North Atlantic (51°51'N, 11°50'W), at a depth of 370 fathoms = 677 m (Norman & Steb-

Table 5. Vertical distribution of Neotanaidae. The bottom temperatures are given in °C. (the not fully reliable ones are in italics).



BING 1886, p. 115). No bottom temperature was given, but the Hydrographic Department of the Danish Fisheries Investigations has kindly furnished me with the following, nearest record (obtained by the Scotia, 21. June 1951):

51°44′N, 12°00′W, 550 m: 10.36°C.

This means that the male in question was taken at a depth which is about 1300 m less than any other depth record of this family, 1800 m less than any of the records of females of the same subspecies, and almost 3000 m less than the average depth record of the family. Still more striking is the high temperature at which the specimen was taken: almost 7°C. higher than for any other specimen of the same subspecies and the other species of the family.

Of course the possibility of wrong labelling always exists, but this is unfortunately one of the many cases where this question is impossible to solve so long afterwards.

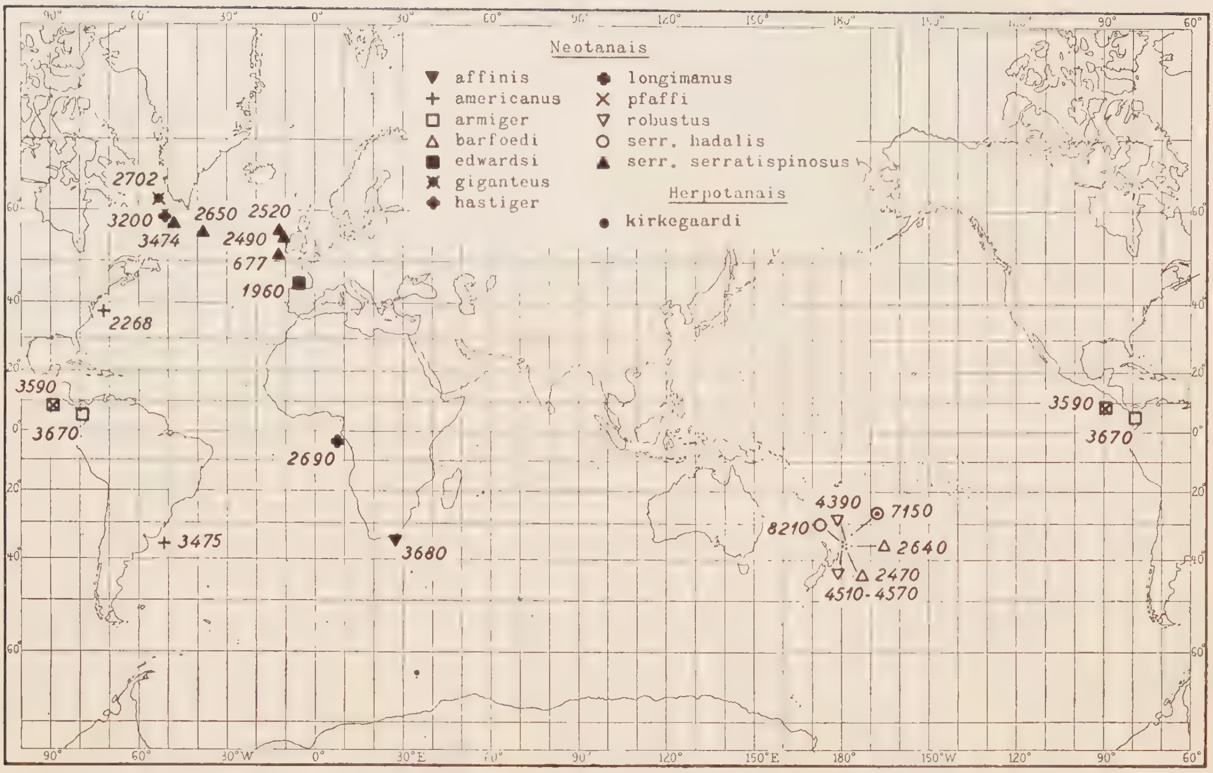

Neotanais
▼ affinis
+ americanus
□ armiger
△ barfoedi
■ edwardsi
✖ giganteus
◆ hastiger
● longimanus
× pfaffi
▽ robustus
○ serr. hadalis
▲ serr. serratispinosus
Herpotanais
● kirkegaardi
2702
3200
3474
2650
2520
2490
677
1960
2268
3590
3670
2690
3475
3680
4390
7150
8210
2640
2470
4510-4570
3590
3670
90°
60°
30°W
0°
30°E
60°
90°
120°
150°E
180°
150°W
120°
90°
60°

Fig. 54. Distribution of Neotanaidae. Depths in meters.

Another explanation might have been that the specimen was collected on a very steep part of the continental shelf where the hydrographic conditions were therefore rather embarrassing. However, according to the detailed bathymetric chart recently published by Hill (1956) the bottom configuration in the locality is not especially uneven and there is a long reach (almost 100 km) to the nearest area with depths of 2000 m and more and with temperatures below 3-4°C.

After all we are probably forced to recognize the aberrant depth and temperature records of this single male. Somehow it corresponds to the rather shallow and warm water records of two species of the 26 otherwise abysso-hadal Isopoda Ischnomesini (Wolff 1956a, p. 141), while the only bathyal species of the abysso-hadal genus *Storthyngura* was antarctic and therefore occurred at very low temperatures (l.c., p. 142).

The females or *serr. serratispinosus* and nine more of the altogether thirteen species and subspecies of Neotanaidae have all been recorded only from depths between 2000 and 4000 m and at temperatures between 3.3 and 0.6°C. (table 5). A single species is known from 4000-6000 m, and one species and one subspecies are hadal or abysso-hadal. Even if the smaller number of trawlings between 4000 and 6000 m is taken into acount the preponderance of species between 2000 and 4000 m is evident and corresponding to the one found in abyssal isopods of five genera of Asellota (Wolff 1956a, p. 147).

It is at present not possible to say anything definite about the vertical distribution of the single species. The fact that all the seven forms of *Neotanais,* collected by the Galathea, had to be considered new species and subspecies shows how much is left to be done in the deep-sea. On the other hand, there is hardly any doubt that the present abysso-hadal Tanaidacea are considerably less eurybathic than other characteristic groups such as Pycnogonida, Holothurians and especially Polychaetes, thus resemling what was found in the Isopoda (l.c., p. 146).

The regional distribution of Neotanaidae is given in fig. 54. To some extent the map shows at the same time the areas where the most extensive deep-sea trawlings have been operating! There are, however, two exceptions to this: (1) The North Polar Sea and (2) the antarctic parts of the three great oceans; these areas have probably been investigated as thoroughly as any of those from where Neotanaidae were recorded. It is unlikely that the comparatively very large species of Neotanaidae were overlooked here; for the time being we must consider Neotanaidae as missing in high arctic and antarctic waters, thus forming a striking contrast to the two most pronounced deep-sea genera of isopods, *Macrostylis* (with representatives in the North Polar Sea) and *Storthyngura* (with one third of the species occurring in antarctic waters).

As in the genera of Isopoda with hadal representatives the species of *Neotanais* which were recorded from equatorial areas are all abyssal, none of them having been taken at depths above 2700 m.

c. Distribution of the hadal Tanaidacea

Although the material of hadal tanaids is much smaller than that of hadal isopods some parallels may be drawn.

(1) One of the exclusively hadal forms is distinctly different from all hitherto known species and must even be regarded as so far the only representative of a new genus. Probably this species belongs to a special fauna, restricted to the hadal zone, as shown for the majority of the hadal isopods (Wolff 1956a) which were described as new species (but which all belonged to known genera).

(2) One of the hadal tanaids is astonishingly similar to a species recorded several times in the North Atlantic *(N. serratispinosus)* and was by me regarded above as a new subspecies of the said species. Also three of the isopods which were taken by the Galathea below 6000 m in the Kermadec Trench had extremely close relatives in deep water far from the trench; these relatives were so closely related that I considered them as belonging to the same species, but probably at any rate one of them could equally well have been regarded as a different subspecies.

(3) In table 13 (l.c., p. 150) I showed that a considerably greater number of species of isopods (and amphipods) were collected by the Galathea in the Kermadec Trench than in the remaining deep-sea trenches together, especially when the number of successful trawlings and bottom samlings was considered; the same preponderance of species in the Kermadec Trench was not found in hadal species of other invertebrate groups. All the three hadal tanaids, however, are from the Kermadec Trench, and in none of the four other deep-sea trenches investigated by the Galathea tanaids were recorded.

As far as I know the Russians have not yet published any records of hadal or abysso-hadal Tanaidacea in the reports on the results of their investigations in the Kurile-Kamtchatka Trench.

3. Relationship and possible origin of the hadal Tanaidacea

a. *Apseudes*. It is interesting to observe that *A. galatheae* seems to be most closely related to some of the deepest representatives of the genus. This applies to some extent to *A. leptodactylus* (Beddard) (near the Azores, 1830 m) and *sibogae* Nierstr. (Banda Sea, 4390 m) and more pronouncedly to *weberi* Nierstr. (Banda Sea, 1570 and 4390 m), *gracilis* Norman & Stebbing (North Atlantic, 1480-3260 m), and *gracillimus* Hansen (North Atlantic, 960 & 3470 m and off S.E. Africa, 3680 m). As pointed out above, the three latter species may belong to a separate subgenus or genus together with *galatheae*, and probably all these four abyssal cold-water species descended from the same ancestor. Also in the hadal Isopoda it was in some cases found that the evidently most closely related abyssal species were recorded extremely far from the trenches in which the hadal species were dredged.

b. *Neotanaidae*. Naturally *N. serr. serratispinosus* from the North Atlantic must be regarded as most closely related to *serr. hadalis;* in fact, the two subspecies are so similar that it was with some hesitation that I split them up. None of the other known species of *Neotanais* is particularly close to *serr. hadalis*.

It is not possible to say anything definite about the relationship of *Herpotanais kirkegaardi* which is so far the only representative of this genus and without special affinities to any single species of *Neotanais*.

Recently Lang (1956, p. 473) pointed out that it is very interesting that all the five species (known to him) of the genus *Neotanais*, which cannot be derived from any known shallow-water forms, are found in the deep-sea only. Since then another seven species and subspecies have been added by me, and the genus has been shown to have an almost cosmopolitan distribution. There is hardly any doubt that Neotanaidae is an archaic group of Tanaidacea as for instance Eryonidae and Homolodromiidae in Decapoda. But while the latter are almost exclusively bathyal and occur at temperatures above 4°C., Neotanaidae are – with one single exception – purely abyssal and thus confined to temperatures below 4°C. Bruun (1956) is probably right in maintaining that most of the living fossils of the deep-sea (as for instance stalked crinoids and hexactinelid sponges) are bathyal. However, Neotanaidae is a striking example of a family which units high age with an almost purely abyssal occurrence, even including one or two hadal representatives.

Table 6. Relation between increasing depth and maximum length of most of the species of *Apseudes*.

Depth	Maximum length in mm	Species
Fresh- and brackish water	5.5	*thaumastocheles* Monod
	7.5	*chilkensis* Chilton
	7.5	*gymnophobia* Barnard
	8	*sapensis* Chilton
Tidal zone	1.9	*garthi* Menzies
	2.1	*tropicalis* Miller
	2.2	*littoralis* Shiino
	2.6	*intermedius* Hansen
	3	*algicola* Shiino
	3	*seurati* Nobili
	3.2	*latus* Chilton
	3.4	*pernix* Menzies
(antarctic)	13	*sculptus* Pfeffer
(antarctic)	14	*spectabilis* Studer
c. 10-200 m	3	*minutus* Claus
	3	*agulhensis* Barnard
	4	*deltoides* Barnard
(antarctic)	4	*antarcticus* Beddard
	4.5	*tenuimanus* G. O. Sars
	6	*espinosus* Moore
	6	*obtusifrons* Norm. & Stebb
	6	*talpa* (Mont.)
	7	*robustus* G. O. Sars
	7.5	*cedroensis* Menzies
	9	*africanus* Tatt.
	9.5	*acutifrons* G. O. Sars
	10	*hibernicus* Walker
	12	*australis* Haswell
(antarctic)	15.5	*hermaphroditicus* Lang
	16	*nipponicus* Shiino
25-1400 m	6	*uncidigitatus* Norm. & Stebb.
	8.5	*echinatus* G. O. Sars
	12	*graciloides* Stephensen
	12.7	*grossimanus* Norm. & Stebb.
	13.8	*spinosus* G. O. Sars
1400-3000 m	6	*coecus* W.-Suhm
(antarctic)	9.5	*sp.* Vanhöffen
	10	*tenuis* Hansen
	13	*leptodactylus* Beddard
	13	*gracilis* Norm. & Stebb.
	15	*simplicirostris* Norm. & Stebb.
1000-3700 m	14.5	*gracillimus* Hansen
1600-4400 m	15	*weberi* Nierstrasz
4400 m	21	*sibogae* Nierstrasz
4500-6800 m	20.8	*galatheae* Wolff

It is worth mentioning that the absence of Neotanaidae in arctic and antarctic waters may be another evidence of the relict nature of the family. At any rate this absence (as pointed out above, p. 235) is different to what is found in some of the most pronounced deep-sea genera and larger groups of Isopoda, such as *Macrostylis, Storthyngura* and Ischnomesini all of which are probably of a much later origin than Neotanaidae.

4. Special peculiarities of the abyssal and hadal Tanaidacea

a. Size

In my report on the hadal Isopoda (Wolff, 1956a, p. 152) I demonstrated that not only seems there to be correlation between increasing depth and larger size, but there may also in the isopods be a connexion between large size and southern distribution. The first of the three genera of Tanaidacea here treated supports this suggestion.

Apseudes. In table 6 I have arranged the species in accordance with increasing depth and size. The size records were found by means of the list of papers given by Nierstrasz (1913, pp. 9-14) and the references above (p. 232). Unfortunately, in some descriptions (especially by Miss Richardson) no measurements were given or only immature specimens were at hand; these instances have been omitted in the table.

Concerning the geographical factor it is obvious that three of the four antarctic species (*sculptus, spectabilis,* and *hermaphroditicus)* are among the largest of all species of *Apseudes* and larger or much larger than all other species (except *nipponicus)* from correspondingly shallow water. However, the fourth antarctic species, *antarcticus,* is only 4 mm long; this is probably the correct length of the adults since both Beddard (1886) and Vanhöffen (1914) record this size.

It is evident from table 6 that larger size seems to be correlated with greater depth, i.e. changed environment. The average lengths of the tanaids from the various groups of localities (depths) are:

Fresh- or brackish water: 7.1 mm
Tidal zone (excl. antarctic spp.): 2.7 –
– (incl. – –): 4.8 –
c. 10-200 m (excl. – –): 8.6 –
– (incl. – –): 8.8 –
25-1400 m: 10.6 –
1400-4400 m: 12.0 –
4400-6800 m: 20.9 –

The rather large size of the fresh- and brackish water species may seem strange but is a general feature within many oligohaline representatives of mainly marine animal groups (e.g. Palaemonidae).

Apart from the remarkably large species *nipponicus*[1] from shallow water (13 m) round Japan all species beyond a length of 10 mm are either antarctic, truly abyssal, or have a sublittoral-bathyal distribution in the temperate zones only.

Neither in *Apseudes* nor in the pronouncedly abysso-hadal isopod genera *Ischnomesus, Ilyarachna* and *Storthyngura* (Wolff 1956a, p. 153) do we find large shallow water representatives in arctic seas. Moreover, such representatives seem to be rare in the two orders on the whole *(Mesidothea* being a notable exception, perhaps owing to its euryhaline nature).

Neotanaidae. In the Ingolf Report Hansen (1913, p. 6) recorded the size of *N. giganteus* as "about twice as long as any male or female hitherto known of this family from any sea". With "this family" he meant the Tanaidae of that time, corresponding to the present Tanaidae, Paratanaidae, and Neotanaidae. As far as I know there has been no record since 1913 of a representative of any of these three families which attained a size corresponding to that of *giganteus.*

Table 7 shows that the lengths of the Galathea species of Neotanaidae are remarkably great, in some cases even greater than Hansen's giant; in fact, *H. kirkegaardi* is by far the largest of all known tanaids and *N. robustus* the largest but one.

Table 7. Maximum lengths and depth records of the species of Neotanaidae.

Species	Length in mm	Depth in meters
Neotanais serr. serratispinosus	8.5	680-3470
– *edwardsi*	9	1960
– *americanus*	6	2270-3480
– *barfoedi*	16.5	2470-2640
– *longimanus*	19.2	2690
– *giganteus*	20	2700
– *hastiger*	5	3200
– *pfaffi*	20.7	3590
– *armiger*	10.2	3590-3670
– *affinis*	9.9	3680
– *robustus*	22.1	4390-4570
– *serr. hadalis*	15.7	7150-8210
Herpotanais kirkegaardi	25.0	7150

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[1] The measurement given in fig. 1 (Shiino 1937) also indicates a length of 16 mm.

Not only is *Neotanais* the most pronounced (polytypic) deep-sea genus known within the tanaids (see p. 232), but it is also (apart from the monotypic genus *Herpotanais* of the same family) *the genus of Tanaidacea with by far the largest species.* The average maximum size is 13.5 mm which is almost 1.5 times longer than of any representative of the families Tanaidae and Paratanaidae. The average maximum size of the family is 14.4 mm.

It will be seen from the table that although the genus *Neotanais* is very homogeneous morphologically, the size of the species varies to a considerable degree (from 5 to 22 mm). It is also obvious that within this genus there is evidently no special correlation between very large size and very great depth.

b. Other features

It is not astonishing that all the three hadal tanaids are blind. In *Apseudes* many other species are also blind or have unpigmented visual elements; even a few of the shallow-water species (e.g. *spectabilis* Studer and *australis* Haswell) are totally blind. All the other, abyssal species of Neotanaidae are likewise blind.

The calcification of *A. galatheae* is not quite so strong as in *A. spinosus,* but stronger than in for instance *A. gracillimus.* Both *N. serr. hadalis* and *H. kirkegaardi* are very strongly calcified, the integument being thick and apparently more robust than in any of the abyssal Neotanaidae.

As in the hadal isopods the colour of all three tanaids is milky white both when freshly caught and in alcohol, but it has never the shining tinge found in a few of the isopods. The previously largest recorded tanaid (excl. Apseudidae), *Neotanais giganteus,* was according to Hansen (1913, p. 21) "quite white when hauled up from the sea"; during the sixty years since the capture its body has become somewhat yellowish.

On the whole, the three hadal tanaids are very similar to their abyssal and bathyal relatives, thus resembling also in this respect the isopods from the greatest depths.

5. Biology

It is regrettable that none of the females of this material had eggs in the marsupium. The fact that neither any of the 40 females of hadal isopods nor any of the 30 females of hadal tanaids, so far collected, have been egg-bearing might indicate that the egg-bearing period is either very short or confined to a special season.

Both explanations appear, however, unlikely. Concerning the length of the egg-bearing period it is a well known fact that arctic-antarctic and temperate shallow-water invertebrates with an unpelagic development have a far longer egg-bearing period than species with pelagic larvae. It is probable that the egg-bearing period of the deep-sea isopods and tanaids lasts several months.

The confinement of the reproduction in the deep-sea to a special season is not likely in case of an environment as stable as that of the deep-sea, and is also contradicted by the mode of reproduction found in high latitudes under similar stable conditions.

It is of course possible that egg-bearing females are not so easily caught as other females and the males. Perhaps they prefer a more fossorial life during that period, and thus succeed in avoiding the not very deep-digging trawls used during the Galathea Expedition.

Finally, the lack of egg-bearing females may be due to the fact that these hadal crustaceans grow very old. Although it was shown above for *A. galatheae* and *H. kirkegaardi* that each female must pass through several egg-bearing periods lasting probably at least three months) these periods may occur only once every second or third year, provided that the female reaches an age of, say 15-20 years. In this case the chance of collecting egg-bearing females is of course much smaller.

E. SUMMARY

1. A special chapter discusses the terminology of body segments, appendages etc. It is proposed to name the seven free thoracic segments in Isopoda and Amphipoda peraeonites 1-7 and to use the same appellation in Tanaidacea (which have always peraeonite 1 forming part of the carapax). Accordingly, the legs are called peraeopods II-VII (peraeopod I = cheliped). The pleon segments should be named pleonites 1-5 (followed by the pleotelson), and the pleopods likewise numbered 1-5 (followed by the uropods). It is suggested always to use "joint" for subdivision of appendages and "segment" for subdivision of the body.

2. During the Galathea Expedition three species of tanaids were collected in the Kermadec Trench at depths greater than 6000 m. One is a new species of *Apseudes,* the second belongs to a new genus of Neotanaidae, and the third is described as a new subspecies of *Neotanais serratispinosus*. Moreover, a few closely related species are redescribed for comparison.

3. The postmarsupial development of *Apseudes spinosus,* M. Sars, *A. galatheae* n. sp., *A. gracillimus* Hansen, and *Herpotanais kirkegaardi* n. gen., n. sp. is discussed.

4. It is suggested that hermaphroditism occurs in four species. In *Apseudes gracillimus* and *A. galatheae* the hermaphroditism seems to be protandric, since (1) all males (from the same locality) are larger than all preadult stages and smaller than any adult female, (2) the material of *gracillimus* comprises two distinct intermediate forms which combine several male and female characters, (3) a late preadult specimen of *galatheae* shows transition to a male phase. In *Neotanais serratispinosus hadalis* n. subsp. the material comprises one pure male and one transitional male with several female characters. It seems most likely that in this case simultaneous hermaphroditism (previously known in *Apseudes hermaphroditicus)* occurs together with gonochoristic reproduction. Two females of *N. longimanus* Wolff exhibit one rudimentary male character (males of *longimanus* are unknown), and this probably also indicates hermaphroditism in this species. A common feature in all five tanaid species in which hermaphroditism seems to occur is that they are confined to cold water and all (except *A. hermaphroditicus)* are abyssal or hadal.

5. *Apseudes* is preferably a shallow-water genus with only six abyssal species and one species *(galatheae)* penetrating into the hadal zone. The regional distribution of the genus is cosmopolitan.

6. The vertical distribution of Neotanaidae is given in table 5. One male of the otherwise abyssal subspecies *N. serr. serratispinosus* is bathyal (collected at a depth of 680 m and about 10° C). Apart from this single record all the remaining representatives of the family are from depths greater than some 2000 m and live at temperatures below 3.3°C. Thus, Neotanaidae is undoubtedly one of the most pronounced abysso-hadal families or major taxons of invertebrates to be found. The average of the total of 22 depth records is 3600 m. As in the abyssal and hadal species of five genera of Isopoda Asellota (Wolff 1956 a) the vertical distribution is considerably more restricted and the stenothermy much greater than in other characteristic invertebrate groups in the deep-sea, such as Pycnogonida, Holothurioidea and especially Polychaeta. – The regional distribution of Neotanaidae is cosmopolitan except for the fact that they seem to be missing in the North Polar Sea and in antarctic areas.

7. The hadal tanaids agree with the hadal isopods (l.c.) in the following respects: (1) One of them is distinctly different from any other known species (even being a representative of a new genus), and thus probably belonging to the special fauna restricted to the hadal zone; (2) one is extremely close to a species from the North Atlantic (as three of the species of isopods occurring in the hadal zone as well as abyssally in areas far from the trench in which they were collected); (3) of the five deep-sea trenches investigated by the Galathea tanaids were recorded only from the Kermadec Trench (both isopods and amphipods show a similar preponderance in this trench).

8. The abysso-hadal *Apseudes galatheae* is most closely related to the bathyal and abyssal members of that genus and probably descended from the same ancestor as those. The very archaic family Neotanaidae which cannot be derived from any known shallow-water forms is a striking example of a higher taxon of invertebrates which units high age with an almost purely abyssal occurrence, even including hadal representatives. The relict nature of the fa-

mily is also emphasized by its absence in arctic and antarctic waters which include several species of the most pronounced deep-sea genera of isopods of a much later origin.

9. The size of the abyssal and hadal Tanaidacea is remarkably large. Table 6 shows that in *Apseudes* there seems to be a correlation between larger size and increasing depth as well as southern distribution (as in many isopods). The average maximum size of the preferably abyssal Neotanaidae is no less than 14.4 mm which is much more than in the other four families of Tanaidacea and even 1.5 times more than in *any* representative of Tanaidae and Paratanaidae. Seven of the ten largest species of tanaids belong to Neotanaidae. Table 7 shows that in this deep-sea family there is no special correlation between large size and increasing depth.

10. Apart from the size the general appearance of the hadal tanaids is very similar to that of their abyssal and bathyal relatives. The colour is always milky white, the calcification is comparatively strong or very strong, and they are all blind.

11. The fact that none of the hadal female tanaids or isopods, so far collected, had eggs in their marsupium probably indicates either that such females are not easily caught by trawls or that they reach a considerable age.

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SOME FREE-LIVING MARINE NEMATODES

By WOLFGANG WIESER

1. Taxonomy of the Thoracostoma species

The bottom-samples of the Galathea-Expedition hitherto available contained three species of nematodes. These were found at the following stations:

Station

281. Locality: SW of Ceylon, 3°38′N, 78°15′E. Bottom: Globigerina ooze. Depth: 3300-3400 m. Date: 10. 4. 1951.
626. Locality: Tasman Sea, 42°10′S, 170°10′E. Bottom: Glob. ooze. Depth: 595 m. Date: 20. 1. 1952.
664. Locality: Kermadec Trench, 36°34′S, 178°57′ W. Bottom: clay. Depth: 4510-4570 m. Date: 24. 2. 1952.

All three species belong to the genus *Thoracostoma*. Two species are new and the third is known from off the Chilean coast (WIESER 1953a). The taxonomy of the genus *Thoracostoma* has been revised in an earlier paper (loc. cit.), but the species from the Galathea-Expedition render the status of the said genus still more complicated. One of the main problems is due to our incomplete knowledge of the buccal armature in the two related genera *Synonchus* and *Thoracostoma*. Satisfactory information on this point can be gained only by means of "en face" observation of the head, a method which has been applied only in a very small number of the known species, e. g. in *Thoracostoma setosum* and *T. arcticum* by DE MAN (1904).

Owing to this deficiency the two genera *Synonchus* and *Thoracostoma* are not distinctly separated. It is true, that the shape of the tail is commonly used as a distinguishing character, it being clavate in *Synonchus* and short-cylindrical in *Thoracostoma;* but from what I can infer from the literature I conclude that the structure of the buccal armature should provide another – and more significant – means of segregating these two genera. I consider the presence of a number of distinct, regularly arranged, triangular plates a character typical of *Synonchus* which has been described in *S. fasciculatus (= Fiacra brevisetosa)* by STEKHOVEN & ADAM (1931) and by BRESSLAU & STEKHOVEN (1940), in *S. strasseni* and *S. comes* by TUERK (1903), and in *S. longisetosa* by SOUTHERN (1914). In *Thoracostoma* the buccal armature always appears to be of a different structure. However, this question is not yet settled, since a number of species are insufficiently described, and we must resort to the shape of the tail to distinguish between *Synonchus* and *Thoracostoma*. One of my new species, viz. *Thoracostoma galatheae,* possesses a short and rounded tail as is typical of this genus, but a cephalic and stomodaeal capsule which are very much like those of *Synonchus fasciculatus* or *S. comes* quoted above. Owing to the uncertainties mentioned I considered the shape of the tail the more important generic feature for the time being and referred the said species to *Thoracostoma,* establishing a new subgenus, *Synonchoides,* for it. I feel this the more justifiable since I could not make out the structure of the gubernaculum with certainty in the two present males. However, I am convinced that when increased knowledge of this and related species has been obtained the subgenus *Synonchoides* should be given generic rank, and that it will find its taxonomic position between the genera *Thoracostoma* and *Synonchus*.

Another problem concerns the well known subgenera *Thoracostoma* s. str. and *Pseudocella*. As to their status I wrote in my earlier paper: "The two subgenera *Pseudocella* FILIPJEV 1927 and *Thoracostoma* s. str. are well established. Not only are they distinguished by the presence or absence of ocelli, but also – as already stated by FILIPJEV – by the shape of the spicular apparatus: in the former subgenus the spicula are regularly bent and almost even in thickness, the accessory piece is provided with a *rectangular* caudal apophysis; in *Thoracostoma* s. str. the spicula consist of two portions, the proximal being narrower than the distal one and bent at a different angle, the accessory piece is closer to the spicula and the apophysis *not* rectangularly bent."

On the basis of this diagnosis the species *Thoracostoma philippinensis* ALLGEN 1951 was referred to *Thoracostoma* s. str. though it was said to be devoid of ocelli. I thought at this time that ALLGEN might have overlooked the ocelli. However, I have now more than 20 specimens of a new species *T. bruuni,* at hand which are definitely devoid of ocelli but the spicular apparatus of which is in full accordance with the definition of the subgenus *Thoracostoma* s. str. Hence the absence or presence of ocelli is ruled out as a distinguishing character between the subgenera *Thoracostoma* s. str. and *Pseudocella.* There remains the possibility of establishing a new subgenus for species devoid of ocelli but provided with a genital armature as in *Thoracostoma* s. str. I refrain from doing so since more should be known about this group. *Thoracostoma bruuni* is furthermore characterized by the possession of a vast buccal cavity and it may be distinguished from all other species of *Thoracostoma* by this additional character.

Finally, I found the male of *Thoracostoma (Pseudocella) kreisi* WIESER 1953, belonging to group B) in my previous paper. I now consider the differences in the shape of the cephalic capsule between this group and the remaining species of *Pseudocella* as sufficiently important to establish a new subgenus, *Corythostoma.*

Summing up the genus *Thoracostoma* MARION comprises now 4 subgenera the key to which is as follows:

A. Spicula consisting of two portions, the proximal being narrower than the distal one and bent at a different angle; accessory piece close to the spicula without caudal apophysis. Cephalic capsule long, well developed; interlobar incisions present, narrow or wide; interlobular fenestrae conspicuous, regularly to irregularly oval; no anterior lobes (for the nomenclature of the leptosomatide head cf. WIESER 1953 b):

   Subg. *Thoracostoma* s. str.

   1. Ocelli present.
      To this section belong all species referred to *Thoracostoma* s. str. as groups A), B), and C), in my previous paper (1953 a).
   2. Ocelli absent.
      a. Amphids in posterior portion of cephalic capsule; gubernaculum with *anterior* apophysis:
         T. (T.) philippinensis ALLGEN 1951
      b. Amphids in middle portion of cephalic capsule; gubernaculum without anterior apophysis:
         T. (T.) bruuni n. sp.

B. Spicula simple, of even thickness, regularly curved; accessory piece with *caudal* apophysis. Cephalic capsule as in *Thoracostoma* s. str. Amphids completely surrounded by the lobes of the cephalic capsule. No ocelli:

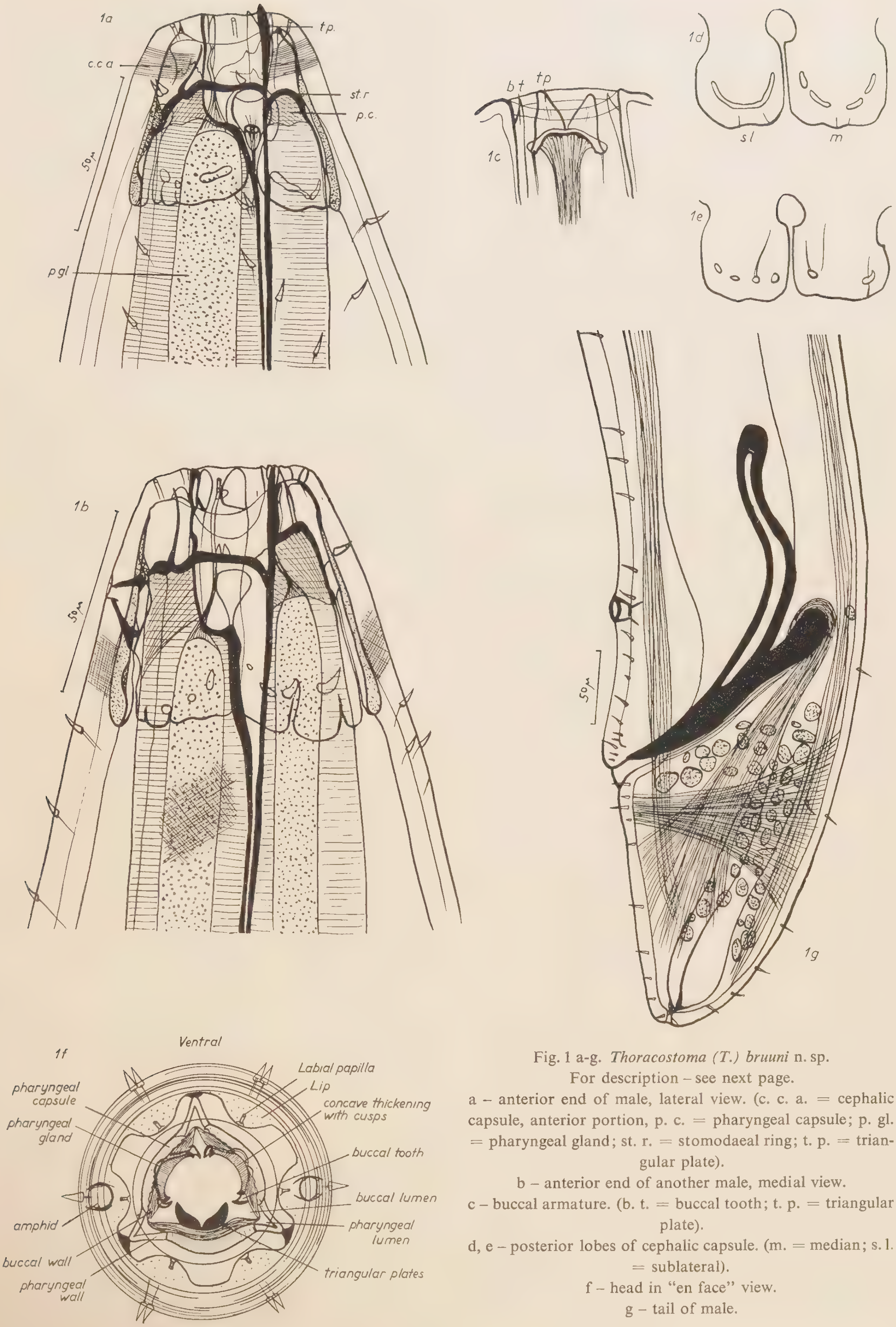
   Subg. *Pseudocella* FILIPJEV 1927
   To this subgenus belong all species described as group A) of *Pseudocella* in my previous paper.

C. Spicula as in *Pseudocella.* Cephalic capsule short, lobes weakly developed and separated by notches only; neither incisions nor fenestrae present; anterior lobes present. Amphids totally or with their greatest portion situated behind the posterior edge of the cephalic capsule. No ocelli:

   Subg. *Corythostoma* subg. nov.

   1. Amphids in male less than one tenth of corresponding diameter wide. Cephalic setae more than one third of cephalic diameter long. Interlobar notches of cephalic capsule shallow:
      T. filipjevi KREIS 1928
   2. Amphids in male 30% of corresponding diameter wide. Cephalic setae one fifth of cephalic diameter long. Interlobar notches of cephalic capsule deep:
      T. kreisi WIESER 1953 a
      (The male of this species described below is new to science).

D. Spicula simple, regularly curved; accessory piece apparently without caudal apophysis. Cephalic capsule still more reduced than in *Corythostoma,* consisting of a ring with slightly notched posterior edge; no anterior lobes. Amphids posterior to cephalic capsule. No ocelli. Buccal armature resembling that of *Synonchus:* Subg. *Synonchoides* subg. nov. with a single species, *T. galatheae* n. sp.


1a
t.p.
c.c.a
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50µ
p.gl
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1c
bt
tp
1d
sl
m
1e
50µ
1g
1f
Ventral
Labial papilla
Lip
pharyngeal capsule
pharyngeal gland
concave thickening with cusps
buccal tooth
buccal lumen
amphid
pharyngeal lumen
buccal wall
pharyngeal wall
triangular plates

Fig. 1 a-g. *Thoracostoma (T.) bruuni* n. sp.
For description – see next page.
a – anterior end of male, lateral view. (c. c. a. = cephalic capsule, anterior portion, p. c. = pharyngeal capsule; p. gl. = pharyngeal gland; st. r. = stomodaeal ring; t. p. = triangular plate).
b – anterior end of another male, medial view.
c – buccal armature. (b. t. = buccal tooth; t. p. = triangular plate).
d, e – posterior lobes of cephalic capsule. (m. = median; s. l. = sublateral).
f – head in "en face" view.
g – tail of male.

Thoracostoma (T.) bruuni n. sp.

(Fig. 1 a-g, fig. 2)

Station 626. Total of specimens: 8 juv., 10 ♀♀, 3 ♂♂.

	juv.:	♀♀:
L —	9,62 – 15,2 (13,02)	15,91 – 19,61 (17,45)
a =	29,0 – 45,6 (37,9)	40,0 – 47,4 (42,0)
b =	4,3 – 5,9 (5,0)	5,0 – 5,5 (5,3)
c =	74,6 – 117,4 (95,0)	98,2 – 132,5 (113,1)
Vu =		52,6 – 61,4 (57,7)

♂♂
17,02 – 18,13 (17,76)
37,7 – 48,0 (43,9)
5,4 – 5,7 (5,6)
92,0 – 98,0 (96,0)

The cephalic diameter measures 64-65 μ = approximately 15% of the diameter at the end of the esophagus. The cephalic capsule is very well developed and approx. 56 μ long. The posterior portion consists as usual of 6 lobes each of which is faintly trilobate. Irregular furrows and locules are present; sometimes the locules fuse so as to form a semicircular groove in the posterior portion of the lobe (fig. 1 d). The submedian interlobar incisions are narrow and long; the lateral incisions which lead to the amphids are somewhat wider and shorter. The fenestrae are almost regularly oval, the lateral ones being bigger than the submedian ones. The anterior portion of the cephalic capsule is weakly developed, and there are apparently no regular lobes; however, this portion is difficult to analyse. The amphids measure 14,5 μ in width in the male, and in medial view (fig. 1 b) it can be seen that they are accompanied by sclerotized plates. The cephalic setae are 6 μ long. In the cervical region there are irregularly scattered setae the most characteristic of which form a group of two to three setae right posterior to the lateral incisions of the cephalic capsule. The cuticle is finely transversely striated in front of the cephalic setae (fig. 1 a) and obliquely striated posterior to the latter (1 b). The six lips are conspicuous, each provided with a labial papilla. The buccal cavity is deep and large; it consists of a cylindrical portion, 44 μ deep, and of a conical portion which actually is the dilated anterior lumen of the pharynx. Between these two portions a tooth-like elevation of the buccal wall may by present.

The buccal armature is complicated and can be analysed in "en face" view of the head only (fig. 1 f). The most prominent structure are two fused triangular plates (fig. 1 c) which are situated on the dorsal wall of the buccal cavity. These two plates are homologous with the structure described as "piéce cordiforme" by De Man (1904) in *Thoracostoma antarcticum.* Corresponding to the triangular plates on the dorsal wall there are concave cuticular thickenings on the two subventral walls of the buccal cavity, each thickening provided with two cusps on its distal tips. These two cusps are homologous with the tips of the two triangular plates. There are at least four more teeth, two on each subventral wall, situated slightly distally and caudally to the concave thickenings. Level with these teeth the latero-ventral pharyngeal glands open. The pharyngeal capsule is well developed (fig. 1 f), and so is the stomodaeal ring (cf. Wieser 1953 b) which is fused with both the buccal wall and the cephalic capsule (fig. 1 a, b).

In its anterior portion not only the lumen but also the outer contour of the pharynx is triradiate (fig. 1 f).

The nerve-ring is situated at 23-25% of the length of the esophagus. The male genital armature is typical of this subgenus. The spicula are 283 μ = 1,7 anal diameters long, irregularly bent, and consisting of two portions: a proximal and a distal one. The gubernaculum is 171 μ long, of irregular thickness and slightly cephalate proximally. There is no caudal apophysis.

The supplement is weakly developed and situated at 114 μ in front of the anus. There are preanal and

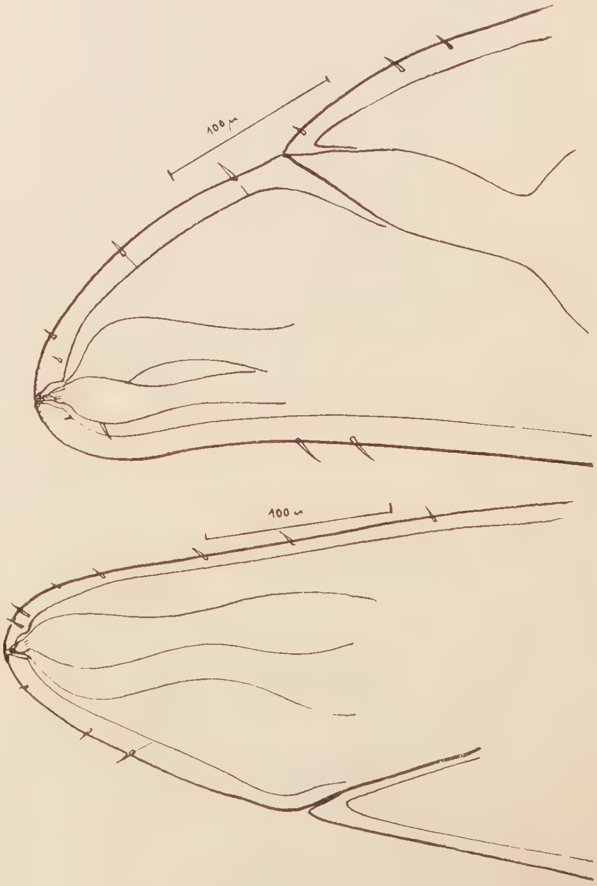


Fig. 2. *Thoracostoma (T.) brunni* n. sp. Tail of two females.

postanal setae. The bursal musculature is strongly developed.

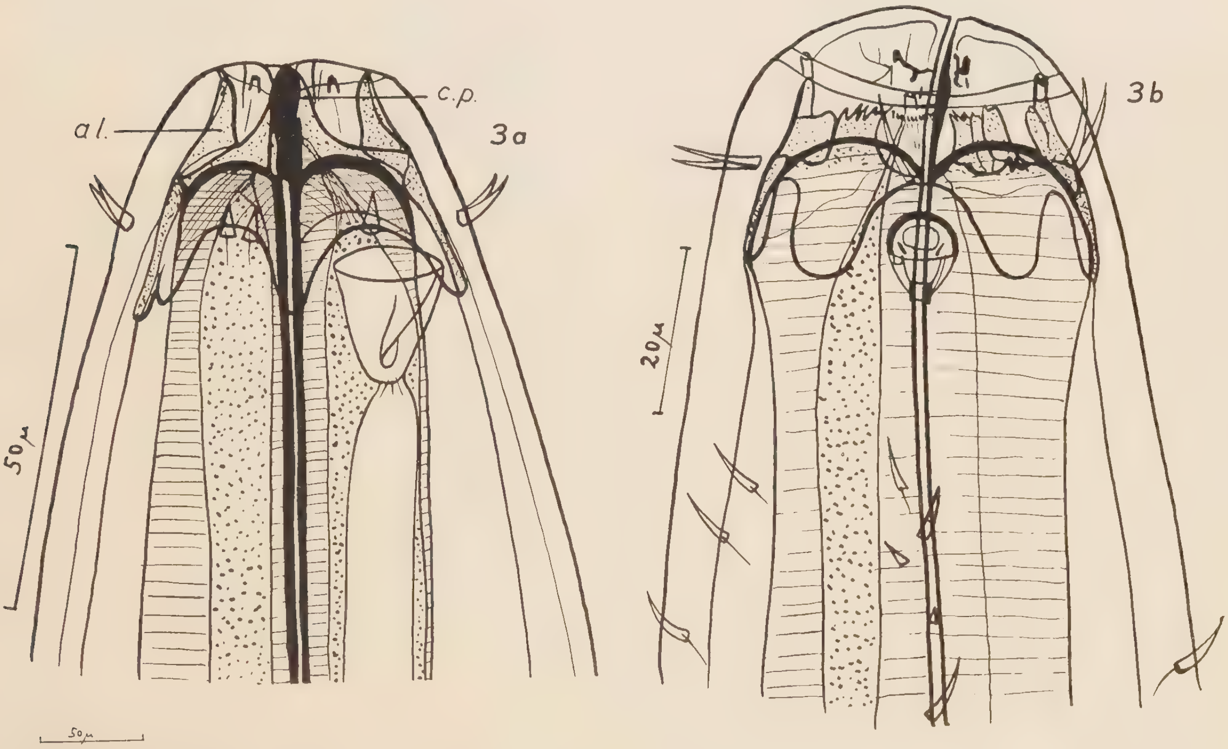
The tail measures about 1 anal diameter both in males and females.

Thoracostoma (Corythostoma) kreisi (WIESER 1953 a)
(Fig. 3 a-c)
= *T. (Pseudocella) k.* WIESER 1953 a

1 ♂ from station 281, SW of Ceylon, 3400 m.
L = 13,7 a = 61,7 b = 7,4 c = 105,7
Dimensions of juveniles from Chile (WIESER 1953 a):
L = 5,78-6,63 a = 34,8-43,5 b = 4,8-5,4
c = 52,1-87,0.

Of this species two juveniles have been found on soft bottom in 18-80 m depth off the Chilean coast. The male from the Galathea-collection obviously belongs to the same species if we take into account the sexual dimorphism as to the shape and size of the amphids, a feature not rarely found in this family. To make clear the differences between the juvenile and the male the head of one of the juveniles obtained off the Chilean coast was re-drawn (fig. 3 b).

The head diameter in the male measures 50 µ = 23 % of the diameter at the end of the esophagus. The cephalic capsule is 23 µ long. The posterior lobes are relatively well developed and separated by deep notches. There are no incisions or fenestrae. All notches are about of the same depth, and the lateral notches are slightly wider than the submedian ones. There are conspicuous anterior lobes the anterior edge of which seems to be deeply incised so as to give the impression of being serrate. This can be inferred from the figure of the juvenile (fig. 3 b), since there the head is viwed sligthly en face (this feature did not show in my previous paper the figure having been drawn on a smaller scale). The amphids measure 15 µ in width in the male and 9-10 µ in the juveniles, i. e. 30 % and 20 % of the corresponding body diameter respectively. In the male the orifice is more narrowly oval than in the juvenile and the pouch is much bigger.



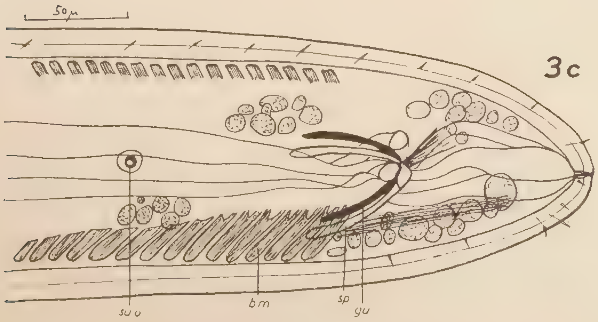


Fig. 3. *Thoracostoma (Corythostoma) kreisi* WIESER

a – anterior end of male. (a. l. = anterior lobes of cephalic capsule; c. p. = clavate piece).

b – anterior end of juvenile (re-drawn from WIESER 1953 a on bigger scale).

c – tail of male. (b. m. = bursal muscles; gu. = gubernaculum; sp. = spiculum; su. o. = supplementary organ).

The cephalic setae are 10-10,5 µ long both in juveniles and in the male. The cervical setae are shorter in the male than in the juveniles, and they are situated more posteriorly in the former than in the latter. There are conspicuous labial papillae.

The buccal armature could not be analysed in detail. There appears, however, to be a sclerotized, clavate piece ("p. cl." in figs. 3a, b) which might be homologous with the triangular plates and the "piéce cordiforme" in *Thoracostoma* s. str. The buccal cavity is narrow. The stomodaeal ring is well developed and fused with the lining of the pharyngeal lumen, with the cephalic capsule ("p. a." in fig. 3b), and apparently also with the clavate piece in the buccal cavity.

The two latero-ventral pharyngeal glands are conspicuous and open as usual in this genus into the anterior portion of the buccal cavity. The nerve-ring is situated at 33% of the length of the esophagus.

The male genital armature could not be analysed, since the male specimen was seen in medial view only. The spicula should measure approximately 61 µ in length, and the gubernaculum appears to be slender. I was not able to find a caudal apophysis which, nevertheless, might be present. The preanal supplement is situated 128 µ in front of the anus.

The tail measures less than 1 anal diameter in length.

Thoracostoma (Synonchoides) galatheae n. sp.
(Fig. 4 a-d)

1 ♂ from station no. 626 (Tasman Sea); damaged
1 ♂ – – – 664 (Kermadec Trench)
(664): L = 20,3 a = 95,5 b = 7,3 c = 138,5.

The head diameter measures 65 µ = 25% of the diameter at the end of the esophagus. The cephalic capsule is short and ring-shaped; the posterior por-

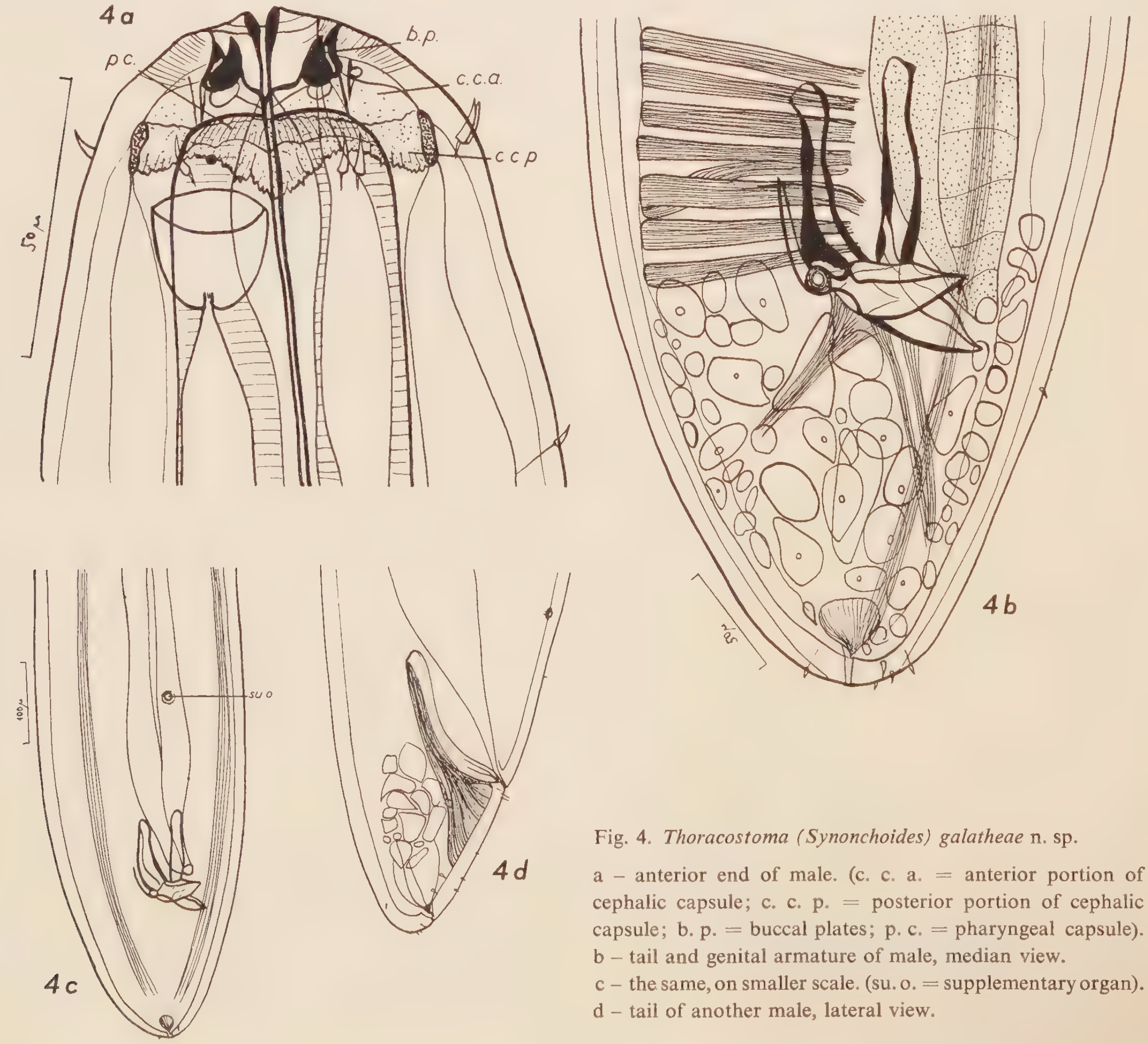


Fig. 4. *Thoracostoma (Synonchoides) galatheae* n. sp.

a – anterior end of male. (c. c. a. = anterior portion of cephalic capsule; c. c. p. = posterior portion of cephalic capsule; b. p. = buccal plates; p. c. = pharyngeal capsule).
b – tail and genital armature of male, median view.
c – the same, on smaller scale. (su. o. = supplementary organ).
d – tail of another male, lateral view.

tion ("c.c.p." fig. 4a) is traversed by irregular longitudinal ridges and its posterior edge is serrated throughout, an unusual feature in this and related genera. The anterior portion of the cephalic capsule ("a. a." fig. 4a) is markedly thinner than the posterior one and is devoid of special structures. The posterior interlobar notches are very shallow and wide. The amphids are situated almost totally posterior to the cephalic capsule; they measure 20 μ = 25% of the corresponding body diameter in width and are regularly pouch-shaped. The cephalic setae are approximately 10 μ long. There are 6 labial papillae.

The buccal armature consists of at least 2 pairs of equal-shaped plates which in lateral view appear to be oval with slightly outwardly curved distal tip. I am not sure whether there is a third pair of plates or not. Each plate is about 10 μ long. In case there are 2 pairs only these are homologous with what I described as "concave cuticular thickenings on the two subventral walls of the buccal cavity" in *Thoracostoma (T.) bruuni* n. sp., and the homologon to the two "triangular plates", i.e. the "piéce cordiforme", is either missing or was overlooked.

At any rate, a paired structure on the anterior end of each of the three sectors of the buccal wall (the cheilostom) appears to be a common feature in all genera of this groups of leptosomatides. Either the dorsal structure only (as in most *Thoracostoma*-species), or the two subventral structures (as perhaps in this species), or all three (as in *Synonchus)* are well developed.

The presence of at least two equal-shaped pairs of buccal plates is another feature by which *Thoracostoma (Synonchoides) galatheae* is distinguished from all other species of this genus, and by which its closer relation with *Synonchus* is expressed.

The two latero-ventral pharyngeal glands open at the base of the buccal plates into the stoma.

Stomodaeal ring and pharyngeal capsule are present.

The cuticle is finely striated; in the cervical region it is 15 μ thick. There are some short cervical setae.

The nerve-ring is situated at 24% of the length of the esophagus. Patches of pigmented granuli are scattered all over the body. The shape of the male genital apparatus could not be clarified in detail. The spicula apparently are simple and regularly curved, the proximal end is slightly cephalate; they are approximately 150 μ = 1 anal diameter in length or less. The accessory pieces most probably are simple, too, and do not possess any well developed apophyses, but whether a small caudal or dorsal apophysis is present cannot be decided on the basis of these two specimens.

There is a very small supplement situated at 190 μ and 228 μ respectively in front of the anus.

The bursal musculature is well developed.

The tail is slightly less than one anal diameter long.

2. List of free-living marine nematodes hitherto reported from more than 400 metres depth

In the following list the specific names are given in accordance with the modern nomenclature, the name under which the respective species was described being added in brackets.

	Author	Position	Locality	Depth (m)
Leptosomatidae:				
Anticoma pellucida BASTIAN	DITLEVSEN 1926	1.) 67°19′N 15°52′W	N of Iceland	528
	–	2.) 57°48′N 7°40′E	Skagerrak	440–460
	–	3.) 57°58′N 8°15′E	–	525–550
Leptosomatum abyssale ALLG.	ALLGEN 1951	?	Sagami Sea, Japan	720
Thoracostoma (T.) arcticum SAVELJEV *(= T. elongatum)*	DITLEVSEN 1926	64°24′N 28°50′W	W of Iceland	1418
*T. (T.) antarcticum (*LINST*)*	ALLGEN 1929	78°38′S 170°21′W	Antarctic (Discovery Bay)	550
T. vallini ALLGEN	–	–	–	–

	Author	Position	Locality	Depth (m)
T. (Pseudocella) coecum Saveljev *(= T. elegans)*	Ditlevsen 1926	1.) 67°19′N 15°52′W	N of Iceland	528
	–	2.) 57°48′N 7°40′E	Skagerak	440–460
T. (Pseudocella) obliqua Ditl.	–	61°32′N 9°43′W	W of the Faroe Islands	1158
T. (T.) bruuni n. sp.	Wieser this paper	42°10′S 170°10′E	Tasman Sea	595
T. (Corythostoma) kreisi Wieser	–	3°38′N 78°15′E	SW of Ceylon	3300–3400
T. (Synonchoides) galatheae n. sp.	–	1.) 42°10′S 170°10′E	Tasman Sea	595
	–	2.) 36°34′S 178°57′W	Kermadec Trench	4510–4570
Synonchus obtusidens (Ditl) *(= Cylicolaimus o.)*	Ditlevsen 1926	1.) 63°30′N 54°25′W	Davis Strait	1048
	–	2.) 65°14′N 55°42′W	– – – –	756
	–	3.) 65°16′N 55°05′W	– –	652
	–	4.) 67°19′N 15°52′W	N of Iceland	528
Synonchus filicaudatus (Ditl) *(= Cylicolaimus f.)*	Ditlevsen 1926	58°10′N 48°25′W	Cape Farewell	3321
S. fasciculatus Cobb	Stekhoven 1946	58°40′N 9°57′E	Skagerrak	530
Cylicolaimus magnus (Villot)	–	–	–	–
Stenolaimus (♂) antarcticus Allgen	Allgen 1929	78°38′S 170°21′W	Antarctic (Discovery Bay)	550
Metacylicolaimus flagellicaudatus Stekhoven	Stekhoven 1946	58°40′N 9°57′E	Skagerrak	530
Rhabdomania laticauda (Ditl.) *(= Demania* l.*)*	Ditlevsen 1926	63°36′N 7°30′W	N of the Faroe Islands	1264
Phanodermatidae:				
Crenopharynx marioni (South) *(= Stenolaimus m.)*	Ditlevsen 1926	1.) 67°19′N 15°52′W	N of Iceland	528
	–	2.) 63°36′N 7°30′W	N of the Faroe Islands	1264
	–	3.) 64°07′N 11°12′W	NW –	427
	–	4.) 57°48′N 7°40′E	Skagerrak	440–460
	–	5.) 57°58′N 8°15′E	–	525–550
	Stekhoven 1946	58°48′N 9°47′E	–	350–400
Micoletzkyia elegans Ditl.	Ditlevsen 1926	1.) 57°48′N 7°40′E	–	440–460
	–	2.) 63°36′N 7°30′E	N of the Faroe Islands	1264

	Author	Position	Locality	Depth (m)
Phanoderma (Alyncoides) parasiticum DITL.	DITLEVSEN 1926	1.) 57°48′N 7°40′E	Skagerrak	440–460
	–	2.) 57°58′N 8°15′E	–	525–550
P. (A.) islandicum DITL.	–	67°19′N 15°52′W	N of Iceland	528
Phanodermopsis groenlandicum DITL.	–	65°16′N 55°05′W	Davis Strait	622
P. caudatum (FILIPJEV)	STEKHOVEN 1946	58°48′N 9°47′E	Skagerrak	350–400
Oxystomatina rotundicaudatum DITL.	DITLEVSEN 1926	57°58′N 8°15′E	Skagerrak	520–550
O. oxyxaudatum DITL.	–	1.) 57°58′N 8°15′E	–	520–550
	–	2.) 58°10′N 9°19′E	–	658
	ALLGEN 1929	78°38′S 170°21′W	Antarctic (Discovery Bay)	550
Enoplidae:				
Enoplus communis BAST. (= *E. pellucidus)*	DITLEVSEN 1926	57°48′N 7°40′E	Skagerrak	440–460
E. groenlandicus DITL.	–	63°30′N 56°00′W	Davis Strait	2160
E. constrictus DITL.	–	67°53′N 10°19′W	NE of Iceland	1820
E. serratus DITL.	–	67°19′N 15°52′W	N of Iceland	528
Oxyonchus polaris (FIL.) (= *Enoplolaimus hamatus)*	–	57°48′N 7°40′E	Skagerrak	440–460
Epacanthion saveljevi (FIL.) (= *Enoplolaimus crassus)*	–	1.) 63°36′N 7°30′W	N of the Faroe Islands	1264
	–	2.) 68°08′N 16°02′W	N of Iceland	1313
Paramesacanthion oxycephalus (DITL.) (= *Enoplolaimis o.)*	–	1.) 66°50′N 20°02′W	–	849
	–	2.) 63°26′N 7°56′W	N of the Faroe Islands	849
	–	3.) 63°36′N 7°30′W	–	1264
Oncholaimidae:				
Filoncholaimus filicaudatus (DITL.) (= *Oncholaimus f.)*	–	58°10′N 9°19′E	Skagerrak	658
Enchelidiidae:				
Symplocostoma (?) dubia DITL.	–	1.) 63°30′N 54°25′W	Davis Strait	1048
	–	2.) 63°36′N 7°30′W	N of the Faroe Islands	1264

	Author	Position	Locality	Depth (m)
Desmodoridae:				
Desmodora (Heterodesmodora) pilosa Ditl.	Ditlevsen 1926	63°30'N 54°25'W	Davis Strait	1048
D. aucklandiae Ditl.	Allgen 1929	78°38'S 170°21'W	Antarctic (Discovery Bay)	550
D. abyssorum Allgen	–	–	–	–
Chromadoridae:				
Euchromadora amokurae Ditl.	–	–	–	–
Prochromadorella antarctica (Cobb) (= *Chromadora mucrodonta* var. *antarctica)*	–	–	–	–
Comesomatidae:				
Dorylaimopsis punctatus Ditl.	Ditlevsen 1926	57°48'N 7°40'E	Skagerrak	440–460
Sabatiera australis Allgen	Allgen 1929, 1946	78°38'S 170°21'W	Antarctic (Discovery Bay)	550
S. praedatrix Bastian	Stekhoven 1946	58°40'N 9°57'E	Skagerrak	530
Sphaerolaimidae:				
Sphaerolaimus hirsutus Bastian	Ditlevsen 1926	1.) 57°48'N 7°40'E	Skagerrak	440–460
	–	2.) 57°58'N 8°15'E	–	525–550

It is premature to draw any conclusions from these data. I confess that it is very tempting to state that most of the deep-sea nematodes belong to the order *Enoploidea (Leptosomatidae* to *Enchelidiidae),* but since these nematodes also are the largest ones (and thus most easily detected in the bottom-samples) their dominance can easily be due to methodological causes. I am the more inclined to make this reservation since from depths between 300 and 400 metres an enormous number of species belonging to the family *Epsilonematidae* has been reported by Steiner (1932). This family comprises the smallest nematodes known; the same holds true of the *Desmoscolecidae* which were found in depths from 200 to 400 metres by Schepotieff (1907). It is unlikely that these small nematodes are prevented by some factor from passing the 400 m-level and we assume that they will also be found at greater depths if thoroughly looked for.

One statement can be made with fair safety, viz. that it is the two closely related genera *Thoracostoma* and *Synonchus* which are the most common deep sea nematodes among the larger forms. The three deepest samples, i. e. 4510-4570 m, 3300-3400 m (Galathea-expedition), and 3321 m (Ingolf-expedition), contained only specimens belonging to either of these two genera.

Of the 43 species listed in the table above the following species are confined to depths greater than 400 m:

Thoracostoma (Pseudocella) obliqua Ditlevsen 1926
T. (T.) bruuni n. sp.
T. (Synonchoides) galatheae n. sp.
Synonchus obtusidens (Ditlevsen 1926)
S. filicaudatus (Ditlevsen 1926)
Stenolaimus (?) antarcticus Allgen 1929
Rhabdodemania laticauda (Ditlevsen 1926)
Enoplus groenlandicus Ditlevsen 1926
E. constricuts Ditlevsen 1926
E. serratus Ditlevsen 1926
Filoncholaimus filicaudatus (Ditlevsen 1926
Symplocostoma (?) dubia Ditlevsen 1926
Desmodora (Heterodesmodora) pilosa Ditlevsen 1926
D. abyssorum Allgen 1929
Sabatiera australis Allgen 1929.

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